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ces of Metals and Metal Levels in Municipal Wastewaters

Research Report No. 80

Researc Program for the Abatement of Municipal Pollution
und r Provisions of the Canada-Ontario Agreement
on Great Lakes Water Quality

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RESEARCH REPORTS

These RESEARCH REPORTS describe the results of investigations funded under the Research Program for the Abatement of Municipal Pollution within the provisions of the Canada-Ontario Agreement on Great Lakes Water Quality. They provide a central source of information on the studies carried out in this program through in-house projects by both Environment Canada and the Ontario Ministry of Environment, and contracts with municipalities, research institutions and industrial organizations.

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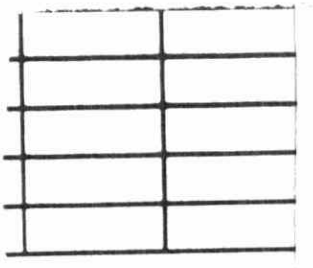

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SOURCES OF METALS AND METAL LEVELS IN MUNICIPAL WASTEWATERS

by

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Ontario Ministry of Environment

RESEARCH PROGRAM FOR THE ABATEMENT
OF MUNICIPAL POLLUTION WITHIN THE
PROVISIONS OF THE CANADA-ONTARIO
AGREEMENT ON GREAT LAKES WATER QUALITY

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ABSTRACT

The main objective of this study was to compile information on typical sources of metals and metal levels in municipal wastewaters and to assess the relative benefits of point-source or end-of-the-pipe treatment for metals.

The specific metal content of a large number of Ontario sewage plant influents, sludges and effluents is recorded in detail for the first time. This was done through a detailed sampling program at selected sewage treatment plants and through a review of the records of the Ontario Ministry of the Environment. Metal removal efficiencies are also recorded and range from 35% (low estimate) for lagoon-type treatment plants to 76% for activated sludge plants.

The sewer-use by-laws of 57 Ontario municipalities were surveyed, showing that there is a wide fluctuation in metal levels allowed by them. It is recommended that these be standardized by strict implementation of a province-wide sewer-use by-law.

The complete elimination of all industrial discharges to sanitary sewers would lower metal concentrations in sewage plant influents, sludges and effluents, but the survey indicates that significant problems would still remain because of the metal content of 'domestic' sewage. A product index, in which the general chemistry of each category is summarized, and a metal index which groups household products according to their contents, are included in this report.

RÉSUMÉ

La présente étude visait d'abord à compiler des données sur les sources typiques de métaux et sur leur concentration dans les eaux résiduaires urbaines, ainsi qu'à l'origine et à la bouche du circuit.

Pour la première fois, on donne en détail la teneur précise en métaux des eaux brutes, des boues et des eaux traitées d'un grand nombre d'usines d'épuration de l'Ontario. Ces données résultent d'un échantillonage détaillé, effectué à certaines usines, et de l'étude des dossiers du ministère de l'Environnement de l'Ontario. Il en ressort que l'efficacité d'épuration des métaux varie entre 35 p. 100 (chiffre prudent) dans les étangs de stabilisation et 76 p. 100 dans les installations de boues activées.

L'examen des règlements de 57 municipalités de l'Ontario a montré que la teneur en métaux permise varie considérablement d'un endroit à l'autre. On recommande de les uniformiser par l'application stricte d'un règlement provincial.

Si les industries cessaient de rejeter leurs effluents dans les égouts pseudo-séparatifs, la concentration de métaux dans les eaux brutes, les boues et les eaux traitées des usines d'épuration diminuerait. L'étude a néanmoins montré que certains problèmes subsisteraient à cause des eaux domestiques. Le rapport comprend aussi un répertoire de produits, résumant les propriétés chimiques générales de chaque catégorie, et un répertoire des métaux groupant les produits ménagers suivant les éléments métalliques qu'ils contiennent.

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CONCLUSIONS

(1) Analytical results based on sampling at 20 sewage treatment plants (see Section 6) of varying types and sizes indicated that the following represented the metal-related average characteristics of Ontario sewage plant influents:

Zn	1.12 mg/l	Li	0.01 mg/l
Cu	0.30 mg/l	Co	0.01 mg/l
Ni	0.11 mg/l	Hg	1.03 ppb
Pb	0.17 mg/l	Sn	0.58 mg/l
Cd	0.02 mg/l	V	0.01 mg/l
Cr	0.97 mg/l	As	0.005 mg/l
Al	3.80 mg/l	Ba	0.18 mg/l
Mn	0.15 mg/l	Sr	0.52 mg/l
Fe	6.58 mg/l	Mo	0.01 mg/l
Ca	93.65 mg/l	Ag	0.01 mg/l
Mg	22.31 mg/l	Se	0.003 mg/l
Ti	0.15 mg/l		

(2) Analytical results based on sampling at 20 sewage treatment plants (see Section 6) of varying types and sizes indicated that the following represented the metal-related average characteristics of Ontario sewage plant effluents:

Zn	0.29 mg/l	Li	less than 0.01 mg/l
Cu	0.06 mg/l	Co	less than 0.01 mg/l
Ni	0.05 mg/l	Hg	0.07 ppb
Pb	0.02 mg/l	Sn	0.42 mg/l
Cd	less than 0.01 mg/l	V	0.01 mg/l
Cr	0.09 mg/l	As	0.001 mg/l
Al	0.47 mg/l	Ba	0.02 mg/l
Mn	0.05 mg/l	Sr	0.42 mg/l
Fe	0.83 mg/l	Mo	0.02 mg/l
Ca	95 mg/l	Ag	less than 0.02 mg/l
Mg	22 mg/l	Se	0.002 mg/l
Ti	0.08 mg/l		

(3) Analytical results (see Section 2) based on unknown sampling and analytical procedures over a two-year period (1974 and 1975) at more than 70 Ontario sewage treatment plants indicated that the following represented average metal removal efficiences of the plants in the sample group:

Zn	60%	Cr	52%
Cu	46%	Al	67%
Ni	19%	Mn	61%
Pb	41%	Fe	81%
Cd	0%		

(4) The controlled data found in Section 6 indicated that the overall metal removal capabilities of existing Ontario treatment plants were as follows:

Zn	54 to 74%
Cu	49 to 80%
Ni	41 to 55%
Pb	46 to 88%
Cd	16 to 50% plus
Cr	54 to 91%
Al	69 to 88%
Mn	48 to 67%
Fe	68 to 87%
Ca	very little removal: approximately 7%
Mg	very little removal: approximately 5%
Ti	24 to 47%
Li	removal mechanism operating: estimate 12%
Co	removal mechanism possibly operating: no estimate
Hg	61 to 93%
Sn	28 to 40%
V	removal mechanism operating: estimate 20%
As	73 to 80%
Ba	62 to 89%
Sr	low removal efficiency: estimate 15 to 19%
Mo	removal mechanism operating: estimate 5%
Ag	removal mechanism operating: estimate 14%
Se	23 to 34%

(5) Analytical results based on sampling at 20 Ontario sewage treatment plants (see Section 6) of varying types and sizes indicated that the following represented the metal removal efficiencies of specific plant types:

NOTE: Removal efficiencies based on Zn, Cu, Cr and Fe (inclusive) only.

(a) lagoon type treatment plants: 35% (low estimate)
(b) primary treatment plants: 47%
(c) activated sludge plants: 76%

(6) Sewer-use by-laws such as the one used by the Province of Ontario (see Section 3) represent an effective way to control metal discharges to municipal sewers. Such by-laws, however, must be rigidly enforced to be effective. Frequent review of the permissible metal levels recommended by such by-laws is necessary in order to accurately reflect constantly changing attitudes and technology.

(7) The complete elimination of all industrial discharges to sanitary sewers would significantly lower the metal concentrations in sewage plant influents, sludges and effluents. However, significant metal problems would still remain because of the metal content of modern day "domestic" sewage (see Section 4).

(8) Point-source (at the industry) treatment of industrial discharges in Ontario at the present time was found to be the rule rather than the exception (see Section 5). In addition, most municipalities in the Province actually regulate industrial discharges to sanitary sewerage systems via sewer-use by-laws (see Section 3).

(9) The prime function of a sewage treatment plant is to prevent contaminants (including metals) from entering receiving water courses in undesirable amounts or concentrations. At the present time, however, even the most modern plants account for only an estimated 75 percent of the metal load discharged to them. The remaining 25 percent escapes the plant.
Given the large number of sewage plants in operation, their usual proximity to areas of human habitation and the high volume effluents

normally encountered at these plants, it would appear to be desirable to increase the metal removal capabilities of most existing and all future plants. This can be done to some extent indirectly by increasing restrictions on industrial discharges to sanitary sewers. The resolution of the total problem, however, lies only at the sewage treatment plant itself.

Research should be directed towards the removal of metals from sewage sludge or towards the stabilization of the metal content of sludge.

1. GENERAL INTRODUCTION

Technical work on Canada-Ontario Agreement (COA) Project 75-1-43 began in the late fall of 1975 and effectively terminated in February of 1977. The stated "objective" of the project was:

> "to compile information on typical sources of metals and metal levels in municipal wastewaters and to provide an assessment of the relative benefits of point-source (at the industry) or end-of-the-pipe (at the sewage plant) treatment for metals".

It has long been known that metals removed by common sewage treatment processes are concentrated in the sewage sludge produced. High metal levels in these sludges have restricted their use on land for agricultural purposes because of problems involving metal toxicity to plants and animals, and because of the possibility of toxic metals naturally leaching from the sludges.

The contract for COA Project 75-1-43 specified that the following work was to be carried out:

(1) Compile from the available sources an inventory of data on metals in municipal sewage (city, plant, dates, flows, metals), quantities (influent, effluent and sludge) and metal removal efficiency.
(2) Compile from available literature an inventory of data on the industrial waste regulations and by-laws of Ontario communities.
(3) Examine data from residential-industrial communities to establish metal type and concentration expected from industrial areas.
(4) Examine data from residential communities to establish metal type and concentration expected from residential areas.

The report has been divided into the following sections:

Section 2 Inventory of Data on Metals in Municipal Sewage (taken from 1974 and 1975 records of the Ontario Ministry of the Environment)
Section 3 By-laws of Ontario Communities
Section 4 Metal Sources in Sanitary Effluents from Residential Areas
Section 5 Sources of Metals from Industrial Areas
Section 6 Project Analytical Results (1975-1976 Field Season)

Section 6 should be regarded as the most important section of the report. Here, for the first time, the specific metal content of a large number of Ontario sewage plant influents, sludges and effluents are recorded in detail. In addition, metal removal efficiencies are recorded, metal loadings are noted and so forth.

The analytical data of Section 6 is augmented by the data in Section 2.

2. INVENTORY OF DATA ON METALS IN MUNICIPAL SEWAGE

2.1 Introduction

Historically, sewage treatment plants were designed to handle predominantly domestic wastes. However, the majority of sewage systems today in the province of Ontario carry both industrial and domestic wastes.

At the present time, Ontario sewage plant influents, sludges and effluents are characterized by a wide and interesting spectrum of metals.

Sewage that is being discharged from a private residence is usually not pretreated before discharge to a sanitary sewer. On the other hand, industrial wastes are commonly pretreated before discharge to a municipal sewerage system and, in many cases, are not directed to a sanitary sewer at all. Where such wastes are directed to a sanitary sewer, the discharge is normally subject to local sewer-use by-laws (see Section 3 of this report).

Sewage treatment systems are usually biological treatment systems and essentially function best with a minimum amount of change in the influent to the system. A random mixture of wastes arriving at a sewage treatment plant must, therefore, be restricted to a narrow range of variation in order to maintain the efficiency of the plant.

The effect of metals on a sewage treatment process depends on the form in which the metals are found. If the metals are in solution, a maximum effect can be expected. If the metals are present as suspended solids, a lesser effect can be expected.

The traditional role of a sewage treatment plant has been to remove biochemical oxygen demand and suspended solids from influent waters. Much less attention has been paid to the removal of influent metals.

One of the main tasks of this project was the determination and characterization of metal levels in sewage plant influents. This was done using two different approaches. The second approach involved a complete and very detailed sampling program at selected Ontario sewage treatment plants. The results of this program form the basis of Section 6 of this report. The first approach, however, involved a simple review of existing records of the Ontario Ministry of the Environment, as presented in this Section.

In all, the records of more than 70 municipally and provincially operated sewage treatment plants were selected for review on the basis of size of municipality, availability of data, type of sewage treatment plant and industrial/domestic load.

2.2 Definitions and Abbreviations

The following is an explanation of the definitions and abbreviations used in this section:

1) Operated by: Sewage treatment plant is owned and operated by the Ministry of the Environment, (MOE) or the municipality.

2) Actual Population: Values are as supplied by the municipality or are from Statistics Canada Census.

3) Population Served by Treatment Facility: Values are as supplied by the municipality or provincial agency.

4) Type of Treatment: Types of treatment are as identified by the municipality or provincial agency.

5) Average Daily Flow: Values as supplied by the municipality or provincial agency are daily waste flows in millions imperial gallons per day at entry to the treatment plant.

6) Analytical Data:

a) Sources
- "Operating Summary - Water Pollution Control Projects 1974", Ontario Ministry of the Environment.
- analytical data from individual sewage treatment plants.
- a municipal or provincial agency.

b) Abbreviations

Chromium is expressed as		Cr
Aluminum	"	Al
Nickel	"	Ni
Lead	"	Pb
Cadmium	"	Cd

Manganese	"	Mn
Calcium	"	Ca
Magnesium	"	Mg
Cobalt	"	Co
Phosphorus	"	P
Sodium	"	Na
Potassium	"	K
Chloride	"	Cl^-
Sulphate	"	SO_4
Mercury	"	Hg
Arsenic	"	As
Silver	"	Ag
Molybdenum	"	Mo
Titanium	"	Ti
Nitrilotriacetic Acid	"	NTA
Tin	"	Sn
Cyanide	"	HCN
Gold	"	Au
Strontium	"	Sr
Zinc	"	Zn
Copper	"	Cu

(c) Units - All concentrations unless otherwise specified are given in mg/l with the exception of pH which is expressed in standard pH units. All concentrations referred to are 'total' concentrations (not 'suspended' and/or 'dissolved' concentrations).

(d) Date Sampled - Data representative of the year 1974 as supplied by the "Operating Summary - Water Pollution Control Projects" is referred to as 1974.

(e) Average - Average value of parameter at individual sewage treatment plant.

(f) * - One value reported only.

(g) Range - Range of values of parameter at individual sewage treatment plant.

(h) Final Provincial Average - Average value of parameter for all sewage treatment plants in sample.

(i) Final Provincial Range - Range of values of parameter for all sewage treatment plants in sample.

2.3 Interpretation

The analytical results that follow in this section were all taken from existing records of the Ontario Ministry of the Environment for the years 1974 and 1975. Although this data does serve as a useful reference source, some caution must be exercised in its interpretation.

The determination of the concentrations of a large number of metals (influent, sludge, effluent) has not been routinely carried out at Ontario sewage treatment plants. While a great deal of sampling for metals has been carried out at some plants, very little has been done at others. Where routine sampling has been carried out, the number of metals investigated has often been limited. This raises one important question. At those plants reporting only limited sampling results, why was the sampling done in the first place? It is always possible that the sewage plant was upset at the time of sampling and abnormal metal concentrations were the suspected cause of the upset. In cases such as this, the metal concentrations reported could hardly be regarded as representative. On the other hand, the close correlation between the data in this section and the data in Section 6 tends to indicate that this is not an important consideration.

2.4 Presentation of Data

The data reviewed are presented in tabular form by municipality.

TABLE 1. ANALYTICAL DATA FOR THE MUNICIPALITY OF ALLISTON

OPERATED BY: MOE

ACTUAL POPULATION: 3176

POPULATION SERVED BY TREATMENT FACILITY: 2200

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .50 mgd

ANALYTICAL DATA

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	pH	P	Na	K	Cl^-
1974	.30	310	26	16	<.40	15	<.10	14	390	2000	280	<.40	6.3	1000	160	90	500
AVERAGE:	*.30	*310	*26	*16	*<.40	*15	*<.10	*14	*390	*2000	*280	*<.40	*6.3	*1000	*160	*90	*500
RANGE: Low																	
High																	

TABLE 2. ANALYTICAL DATA FOR THE MUNICIPALITY OF AURORA

OPERATED BY: Municipality

ACTUAL POPULATION: 13,614

POPULATION SERVED BY TREATMENT FACILITY: 11,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.6 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Al	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 18/74	370	.27	.24	.05	.08	<.01	.26	.16
AVERAGE:	*370	*.27	*.24	*.05	*.08	*<.01	*.26	*.16
RANGE: Low								
High								

DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 19/74	12	5.3	1.8	14	.11	59	6.4
AVERAGE:	*12	*5.3	*1.8	*14	*.11	*59	*6.4
RANGE: Low							
High							

FINAL EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 18/74	.04	.04	.04	.03	<.01	.03	<.02
July 19/74	.03	.03	<.04	.02	<.01	.10	.02
April 22/75						.29	
AVERAGE:	.04	.04	.04	.03	.01	.14	.02
RANGE: Low	.03	.03	.04	.02	.01	.03	.02
High	.04	.04	.04	.03	.01	.29	.02

TABLE 3. ANALYTICAL DATA FOR THE MUNICIPALITY OF BARRIE

OPERATED BY: Municipality

ACTUAL POPULATION: 31,000

POPULATION SERVED
BY TREATMENT FACILITY: 31,390

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 4.1 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
April 10/75	34	34	5.0	16	<.20	370	11
July 16/75	33	24	43	13	<.50	220	8.8
AVERAGE:	34	29	24	15	.35	295	9.9
RANGE: Low	33	24	5.0	13	.20	220	8.8
High	34	34	43	16	.50	370	11

TABLE 4. ANALYTICAL DATA FOR THE MUNICIPALITY OF BELLEVILLE

OPERATED BY: MOE

ACTUAL POPULATION: 35,128

POPULATION SERVED BY TREATMENT FACILITY: 32,677

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 7.8 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Cl^-	SO_4
1974	110	47
AVERAGE:	*110	*47

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	pH	P	Na	K	Cl^-
1974	110	460	51	51	2.5	45	.90	.30	610	2000	130	3.6	7.1	6.7	51	38	140
AVERAGE:	*110	*460	*51	*51	*2.5	*45	*.90	*.30	*610	*2000	*130	*3.6	*7.1	*6.7	*51	*38	*140

EFFLUENT

DATE SAMPLED	Cl^-	SO_4
1974	73	53
AVERAGE	*73	*53

TABLE 5. ANALYTICAL DATA FOR THE MUNICIPALITY OF BRADFORD

OPERATED BY: MOE

ACTUAL POPULATION: 3,401

POPULATION SERVED BY TREATMENT FACILITY: 3,185

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .40 mgd

ANALYTICAL DATA:

MIXED LIQUOR	AERATION TANK #1	MIXED LIQUOR	AERATION TANK #2
DATE SAMPLED	Cu	DATE SAMPLED	Cu
June 13/74	4.0	June 13/74	<.10
June 13/74	4.2	June 13/74	5.2
June 16/74	4.5	June 16/74	4.9
June 16/74	4.8	June 18/74	6.5
June 18/74	5.7	June 19/74	5.7
June 18/74	5.5	June 20/74	6.0
June 19/74	5.3	June 20/74	6.2
June 19/74	5.2	June 21/74	8.9
June 20/74	4.9	June 21/74	8.3
June 20/74	5.3	June 24/74	7.1
June 21/74	5.1	June 26/74	8.5
June 24/74	9.0	June 27/74	8.3
June 24/74	8.3	June 27/74	8.3
June 26/74	8.1		
June 26/74	7.9		
June 27/74	8.1		
June 27/74	7.7		
AVERAGE:	6.1	AVERAGE:	6.5
RANGE: Low	4.0	RANGE: Low	.10
High	9.0	High	8.9

TABLE 5 (CONT'D)

RAW SEWAGE

DATE SAMPLED	Cu
June 13/74	.10
June 18/74	.09
June 19/74	.06
June 20/74	.09
June 21/74	<.05
June 23/74	.09
June 24/74	.14
June 25/74	.11
June 26/74	.11
June 27/74	.14
AVERAGE:	.10
RANGE: Low	.05
High	.14

FINAL EFFLUENT

DATE SAMPLED	Cu
June 13/74	.17
June 18/74	.34
June 19/74	.39
June 20/74	.26
June 21/74	.27
June 22/74	.27
June 24/74	.40
June 25/74	.57
June 26/74	.34
June 27/74	.09
AVERAGE:	.31
RANGE: Low	.09
High	.57

DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
Sept. 30/75	32	40	.80	3.3	.15	3.1	22
Oct. 15/74	32	24	.80	8.1	.30	5.3	22
AVERAGE:	32	32	.80	5.7	.23	4.2	22
RANGE: Low	32	24	.80	3.3	.15	3.1	22
High	32	40	.80	8.1	.30	5.3	22

TABLE 6. ANALYTICAL DATA FOR THE MUNICIPALITY OF BROCKVILLE

OPERATED BY: Municipality

ACTUAL POPULATION: 20,000

POPULATION SERVED BY TREATMENT FACILITY: 22,000

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 3.5 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Cr	Ni	Cu	Cd	Zn
June 28/74	.10	.06	.26	<.01	.23
July 18/74	.13	.08	.34	<.01	.21
July 19/74	.70	.04	.60	<.01	.39
AVERAGE:	.31	.06	.40	.01	.28
RANGE: Low	.10	.04	.26	.01	.21
High	.70	.08	.60	.01	.39

DIGESTER

DATE SAMPLED	Zn	Cr	Ni	Cu	Cd
July 3/74	12	5.8	1.7	41	.54
July 3/74	2.1	1.0	18	6.4	.08
AVERAGE:	7.1	3.4	9.9	24	.31
RANGE: Low	2.1	1.0	1.7	6.4	.08
High	12	5.8	18	41	.54

TABLE 7. ANALYTICAL DATA FOR THE MUNICIPALITY OF BURLINGTON - DRURY LANE WPCP

OPERATED BY: MOE

ACTUAL POPULATION: 97,972

POPULATION SERVED BY TREATMENT FACILITY: 10,500

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.8 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Cl^-
1974	113
AVERAGE:	*113

DIGESTED SLUDGE

DATE SAMPLED	Cl^-	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	pH
June 14/74		95	630	64	45	2.0	18	3.8	2.1	550	2200	250	.48	
1974	73	27	690	59	37	2.1	24	2.5	18	680	2900	650	.60	7.4
AVERAGE:	*73	61	660	62	41	2.1	21	3.2	10.1	615	2550	450	.54	*7.4
RANGE: Low		27	630	59	37	2.0	18	2.5	2.1	550	2200	250	.48	
High		95	690	64	45	2.1	24	3.8	18	680	2900	650	.60	

EFFLUENT

DATE SAMPLED	Cl^-
1974	115
AVERAGE:	*115

TABLE 8. ANALYTICAL DATA FOR THE MUNICIPALITY OF BURLINGTON - ELIZABETH GARDENS WPCP

OPERATED BY: MOE

ACTUAL POPULATION: 97,972

POPULATION SERVED BY TREATMENT FACILITY: 4,500

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .75 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Cl^-	SO_4
1974	89	85
AVERAGE:	*89	*85

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	pH	P	Na	K	Cl^-
1974	.90	200	18	19	.40	4.6	<.10	4.3	45	610	100	<.40	7.2	390	80	41	140
AVERAGE:	*.90	*200	*18	*19	*.40	*4.6	*<.10	*4.3	*45	*610	*100	*<.40	*7.2	*390	*80	*41	*140

EFFLUENT

DATE SAMPLED	Cl^-	SO_4
1974	91	86
AVERAGE	*91	*86

TABLE 9. ANALYTICAL DATA FOR THE MUNICIPALITY OF BURLINGTON - SKYWAY WPCP

OPERATED BY: MOE

ACTUAL POPULATION: 97,972

POPULATION SERVED BY TREATMENT FACILITY: 60,000

TYPE OF TREATMENT: Extended Aeration

AVERAGE DAILY FLOW: 9.0 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Cl^-
1974	126
AVERAGE:	*126

WASTE ACTIVATED SLUDGE

DATE SAMPLED	P	Cl^-	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	Hg	Ti	pH
1974	440	100	16	340	71	16	.80	4	8.7	9	310	560	110	<.40	.400	18	6.7
AVERAGE:	*440	*100	*16	*340	*71	*16	*.80	*4	*8.7	*9	*310	*560	*110	*<.40	*.400	*18	*6.7

EFFLUENT

DATE SAMPLED	Cl^-
1974	119
AVERAGE:	*119

TABLE 10. ANALYTICAL DATA FOR THE MUNICIPALITY OF CAMPBELLFORD

OPERATED BY: MOE

ACTUAL POPULATION: 3,522

POPULATION SERVED
BY TREATMENT FACILITY: 3,500

TYPE OF TREATMENT: Conventional Activated Sludge

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Cl^-	SO_4
1974	47	37
AVERAGE:	*47	*37

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co
Nov. 19/74	2.5	730	15	9.7	.77	1.5	.10	45	370	124	1700	.46
AVERAGE:	*2.5	*730	*15	*9.7	*.77	*1.5	*.10	*45	*370	*124	*1700	*.46

EFFLUENT

DATE SAMPLED	Cl^-	SO_4
1974	42	32
AVERAGE:	*42	*32

TABLE 11. ANALYTICAL DATA FOR THE MUNICIPALITY OF COBOURG

OPERATED BY: Municipality

ACTUAL POPULATION: 11,282

POPULATION SERVED
BY TREATMENT FACILITY: 8,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.5 mgd

ANALYTICAL DATA:

PRIMARY CLARIFIER EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
March 23/75	.09	<.05	<.07	.04	<.02	.19	<.04
March 24/75	.08	<.05	<.07	.03	<.02	.66	<.04
March 25/75	.40	.12	.30	.11	<.02	6.3	.12
March 26/75	.08	.06	<.07	.04	<.02	5.4	.04
March 27/75	.05	.05	<.07	.04	.02	.37	.07
March 28/75	.05	.06	<.07	<.04	<.02	.45	.07
March 29/75	<.05	.05	<.07	.04	<.02	.24	.07
March 31/75	.11	<.05	<.07	<.05		.92	.09
April 1/75	.15	<.05	<.07	<.05		.98	.06
April 2/75	.09	<.05	.09	<.05	<.02	1.4	.08
April 3/75	.11	<.05	<.07	.05	<.02	2.6	.07
April 4/75	.13	.07	<.05	.06	.02	2.5	.10
April 5/75	.21	.08	<.05	.13	.02	3.2	.11
April 6/75	.13	.05	<.05	.03	.02	.24	.07
April 7/75	.20	.05	<.05	.06	.02	1.1	.08
April 8/75	.12	<.05	.08	.07	.02	1.2	.07
April 9/75	.10	<.05	<.07	.06	<.02	1.0	.09
April 10/75	.12	<.05	.07	.11	<.02	1.5	.10
April 11/75	.27	.06	<.07	.20	.02	3.5	.10
April 12/75	.08	<.05	<.07	.03	<.02	.57	<.04
April 13/75	.07	<.05	<.07	.04	<.02	.26	<.04
April 14/75	<.04	<.05	<.07	<.03	<.02	.57	.06
April 20/75	.05	.02	.05	.02	<.01	.22	.01
April 21/75	.49	<.01	.51	.06	<.01	1.1	.03
April 22/75	.12	.04	.41	.09	<.01	1.3	.09
April 23/75	.07	.04	.15	.09	<.01	1.6	.08
April 24/75	.17	.04	.19	.10	<.01	.24	.07
April 25/75	.21	.05	.16	.06	<.01	1.5	.07
April 26/75	.05	.02	.06	.02	<.01	.28	.05
April 27/75	.06	.06	.03	<.01	<.01	.12	.04
April 28/75	.06	.04	.05	.05	<.01	1.1	.26

TABLE 11. (CONT'D)

PRIMARY CLARIFIER EFFLUENT (CONT'D)

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
May 1/75	.07	.06	<.04	.17	<.01	4.5	.07
May 2/75	.14	.06	<.04	.08	<.01	2.7	.07
May 3/75	.04	.03	.02	.03	<.01	.25	.02
May 4/75	.08	.06	.05	.03	<.01	.23	.05
May 5/75	.08	.05	.06	.04	<.01	2.5	.07
May 6/75	.06	.05	.05	.03	<.01	2.5	.06
May 7/75	.05	.04	.05	.03	<.01	.95	.05
May 8/75	.07	.05	.06	.04	<.01	1.1	.06
May 9/75	.06	.04	1.7	.04	<.01	1.5	.06
May 10/75	.04	.03	.51	.03	<.01	.50	.05
May 11/75	.06	.03	.21	.02	<.01	.65	.06
May 12/75	.14	.04	.38	.02	<.01	1.1	.07
May 13/75	.06	.05	.16	.03	<.01	1.6	.07
May 14/75	.04	.03	.08	.27	<.01	1.2	.06
May 15/75	.11	.05	.21	.39	<.01	3.4	.08
May 16/75	.12	.05	.08	.18	<.01	3.7	.08
May 17/75	.04	.03	.06	.03	<.01	.79	.04
May 18/75	.03	.03	.04	.02	<.01	.24	.03
May 19/75	<.05	<.05	<.07	<.05	<.02		<.04
May 20/75	.04	.04	.08	.11	<.01	1.3	.05
May 21/75	.06	.07	.05	.11	<.01	1.5	.04
May 22/75	.09	.08	.03	.18	<.01	3.7	.05
AVERAGE:	.11	.05	.14	.08	.01	1.4	.07
RANGE: Low	.03	.01	.02	.01	.01	.12	.01
High	.49	.12	1.7	.39	.02	6.3	.26

RAW SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 30/74	62	14	5.0	25	.25	150	4.9
Aug. 13/74	23	16	37	40	.20	1100	7.1
July 3/75	24	7.1	3.0	24	.15	800	4.8
AVERAGE:	36	2	15	30	.20	683	5.6
RANGE: Low	23	7.1	3.0	24	.15	150	4.8
High	62	16	37	40	.25	1100	7.1

TABLE 11. (CONT'D)

PRIMARY DIGESTER

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 30/74	31	9.0	7.1	29	.15	250	4.8
Aug. 13/74	31	9.6	7.9	26	.10	300	4.5
July 3/75	19	8.7	6.2	25	.15	870	6.2
AVERAGE:	27	9.1	7.1	27	.13	473	5.2
RANGE: Low	19	8.7	6.2	2.5	.10	250	4.5
High	31	9.6	7.9	29	.15	870	6.2

SECONDARY DIGESTER

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 30/74	30	9.3	8.1	26	.15	270	5.3
Aug. 13/74	35	11	7.9	31	.15	150	4.9
July 3/75	20	9.0	5.9	4.3	.15	770	5.1
AVERAGE:	28	9.8	7.3	21	.15	397	5.1
RANGE: Low	20	9.0	5.9	4.3	.15	150	4.9
High	35	11	8.1	31	.15	770	5.3

FINAL EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
March 23/75	.08	<.05	<.07	<.03	<.02	.04	<.04
March 24/75	.07	<.05	<.07	.03	<.02	.40	<.04
March 25/75	<.05	<.05	<.07	.03	<.02	.51	.04
March 26/75	<.05	<.05	<.07	.03	<.02	.45	<.04
March 27/75	.10	.06	<.07	.04	<.02	1.1	.06
March 28/75	.07	.06	<.07	.04	<.02	.38	.07
March 29/75	.08	<.05	<.07	.04	<.02	.19	.08
March 30/75	<.05	<.05	.07	.04	<.02	.23	.08
March 31/75	.08	<.05	<.07	<.05		.43	.07
April 1/75	.10	<.05	<.07	.05	<.02	.52	.05
April 2/75	.06	<.05	<.07	<.05	<.02	.61	.07
April 3/75	.05	<.05	<.07	<.05	<.02	.56	.07
april 4/75	.06	.05	<.05	.03	.02	2.8	.08
April 5/75	.07	.05	<.05	.03	<.01	.26	.07
April 7/75	.20	.05	<.05	.06	.02	1.1	.08
April 8/75	.09	<.05	<.07		<.02	.37	.05

TABLE 11. (CONT'D)

FINAL EFFLUENT (CONT'D)

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
April 9/75	.07	<.05	<.07		.02	.28	.07
April 10/75	.05	<.05	.07		<.02	.32	.04
April 11/75	<.05	<.05	<.07		<.02	.37	.04
April 12/75	.07	<.05	<.07	.03	<.02	.21	.05
April 14/75	<.04	<.05	<.07	<.03	<.02	.29	.05
April 20/75	.05	<.01	.07	.02	<.01	.11	.04
April 21/75	.14	.01	.34	.03	<.01	.22	.06
April 22/75	.07	.03	.41	.03	<.01	.31	.06
April 23/75	.25	.05	.18	.03	<.01	.46	.07
April 25/75	.07	.03	.16	<.02	<.01	.39	.08
April 27/75	.08	.02	.03	.01	<.01	.05	.04
April 28/75	.04	.03	.04	.04	<.01	.20	.11
April 29/75	.04	<.03	.05	.04	<.01	.31	.10
April 30/75	.06	.03	.06	.04	<.01	.45	.09
May 1/75	.05	<.03	.04	.04	<.01	.25	.11
May 2/75	.06	.07	.04	.06	<.01	.35	.25
May 3/75	.04	.03	.05	<.03	<.01	.22	.05
May 4/75	.03	.03	.04		<.01	.22	.04
May 5/75	.03	.02	.06	.03	<.01	.22	.04
May 6/75	.04	.03	.04		<.01	.33	.05
May 7/75	<.05	<.05	.10	<.01	<.02	.32	.04
May 8/75	<.05	<.05	.08	<.01	<.02	.52	.05
May 9/75	<.05	<.05	.56	<.01	<.02	.40	.06
May 10/75	.02	.03	.77	.03	<.01	.18	.04
May 11/75	<.05	<.05	.37	<.05	<.02	<.14	.04
May 12/75	<.05	<.05	.38	<.05	<.02	.18	<.04
May 13/75	<.05	<.05	.15	<.05	<.02	.36	.04
May 14/75	<.05	<.05	.10	<.05	<.02	.44	.05
May 15/75	<.05	<.05	.15	<.05	<.01	.36	.04
May 16/75	<.05	<.05	.05	<.05	<.01	.44	.04
May 17/75	.03	.03	.05	<.03	<.01	.22	.03
May 18/75	<.05	<.05	<.07	<.05	<.01	.14	<.04
May 20/75	<.05	<.05	.09	<.05	<.02	<.16	<.04
May 21/75	<.05	<.05	<.07	<.05	<.02	.36	<.04
May 22/75	<.05	<.05	.09	<.05	<.02	1.0	.04
AVERAGE:	.07	.04	1.2	.04	.02	.41	.06
RANGE: Low	.02	.01	.03	.01	.01	.04	.03
High	.25	.07	.77	.06	.02	2.8	.25

TABLE 12. ANALYTICAL DATA FOR THE MUNICIPALITY OF COLLINGWOOD

OPERATED BY:	Municipality
ACTUAL POPULATION:	9,775
POPULATION SERVED BY TREATMENT FACILITY:	8,500
TYPE OF TREATMENT:	Primary Sedimentation
AVERAGE DAILY FLOW:	2.5 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	NTA
October 8/75	2.8
October 8/75	1.4
AVERAGE:	2.1
RANGE: Low	1.4
High	2.8

TABLE 13. ANALYTICAL DATA FOR THE MUNICIPALITY OF CORNWALL

OPERATED BY: Municipality

ACTUAL POPULATION: 47,116

POPULATION SERVED
BY TREATMENT FACILITY: 42,500

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 6.5 Mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	Sn
Aug. 11/75	5.7	1500	59	23	4.9	33	.60	29	1200	4600	790	.75	6.7
AVERAGE:	* 5.7	* 1500	* 59	* 23	* 4.9	* 33	* .60	* 29	* 1200	* 4600	* 790	* .75	* 6.7

TABLE 14. ANALYTICAL DATA FOR THE DURHAM REGIONAL MUNICIPALITY - AJAX, DUFFIN CREEK NO. 2 WPCP

OPERATED BY: Municipality

ACTUAL POPULATION: 20,293

POPULATION SERVED BY TREATMENT FACILITY: 17,020

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 2.1 mgd

ANALYTICAL DATA:

RAW SEWAGE (South Plant)

DATE SAMPLED	Cr	Cu	Pb	Ni
June 11/74	.70	1.1	.28	
June 18/74	.59	.66	.30	
June 25/74	.52	1.0	.22	
July 2/74	2.5	.42	.28	
July 9/74	.50	.21	.26	
July 16/74	1.0	5.5	.22	
July 30/74	1.0	2.2	.12	
Aug. 6/74	.32	.76	.18	
Aug. 13/74		2.0	.10	.70
Aug. 20/74	.65	.24	.47	
Aug. 27/74			.56	
Sept. 3/74	.65	5.5	.38	1.0
Sept. 10/74	1.9	.21	.41	.53
Sept. 17/74	1.2	2.1	.56	1.1
Sept. 24/74	.72	.40	.32	1.0
Oct. 1/74	2.2	.39	1.2	3.3
Oct. 8/74	1.1	.39	.28	4.4
Oct. 15/74	.75	1.8	.24	1.3
Nov. 5/74	.60	.35	.15	.30
Dec. 3/74	.65	.36		
Jan. 7/75	.40	.23	.26	.18
Feb. 4/75	.08	.12	.14	<.14
Mar. 4/75	.16	2.2	.28	<.07
Apr. 1/75	.17	.17	.19	1.2
May 13/75		.16	1.2	1.9
June 10/75	.18	.75	.58	.18
July 8/75	.10	.14	.10	.26
Aug. 5/75	.68	.52	1.4	1.5
Sept. 2/75	.18	.21	.15	.18
Sept. 30/75	.66	.13	.34	.13

TABLE 14. (CONT'D)

RAW SEWAGE (South Plant) (Cont'd)

	Cr	Cu	Pb	Ni
AVERAGE:	.75	1.0	.39	1.0
RANGE: Low	.08	.12	.10	.07
High	2.5	5.5	1.4	4.4

RAW SEWAGE (North Plant)

DATE SAMPLED	Cr	Cu	Pb	Ni
June 11/74	.75	.86	.22	
June 25/74	.64	1.2	.21	
July 2/74	.22	.59	.40	
July 9/74	.50	.23	.21	
July 16/74	1.2	2.6	.18	
July 30/74	1.4	1.8	.33	
Aug. 6/74	.90	.95	.35	
Aug. 13/74		1.6	.20	.71
Aug. 20/74	.55	.44	.60	
Aug. 27/74	.55	.20	.30	.47
Sept. 3/74	.55	4.3	.43	1.0
Sept. 10/74	1.8	.65	.66	.70
Sept. 17/74	1.2	2.2	.72	1.2
Sept. 24/74	.85	.45	.56	2.2
Oct. 1/74	2.2	.45	1.0	1.1
Oct. 8/74	1.2	.51	.36	1.4
Oct. 15/74	.70	.56	.23	1.2
Nov. 5/74	.50	.33	.24	.33
Dec. 3/74	.65	.42		
Jan. 7/75	2.0	1.9	1.8	.28
Feb. 4/75	.94	1.1	1.7	.68
Mar. 4/75	.24	.29	.34	<.07
Apr. 1/75	.22	.30	.27	.15
May 13/75	.04	.09	<.01	.10
June 10/75	.14	.14	.12	.19
July 8/75	.29	.50	.61	.48
Aug. 5/75	.29	.18	.51	.12
Sept. 2/75	.47	.37	.88	.25
Sept. 30/75	.63	.19	.32	.22
AVERAGE:	.77	.88	.49	.64
RANGE: Low	.04	.09	.01	.07
High	2.2	4.3	1.8	2.2

TABLE 14. (CONT'D)

PRIMARY DIGESTER SLUDGE

DATE SAMPLED		Cr	Cu	Pb	Ni	Zn	Cd	Zn
June 4/74		130	140	120				
June 11/74		110	130	120				
June 25/74		150	240	.03				
July 2/74		110	180	60				
Sept. 10/74		25	3.6	54	8.8			
Sept. 30/74		.50	8.7	2.1	.40	8.8	<.10	1.7
AVERAGE:		88	117	59	4.6	*8.8	*.10	*1.7
RANGE:	Low	.50	3.6	.03	.40			
	High	150	240	120	8.8			

SECONDARY DIGESTER SLUDGE

DATE SAMPLED		Cr	Cu	Pb
June 4/74		120	140	140
June 11/74		130	150	130
June 18/74		7.4	11	7.6
June 25/74		140	160	.02
July 2/74		140	200	140
AVERAGE:		108	132	84
RANGE:	Low	7.4	11	.02
	High	140	200	140

PRIMARY DIGESTER SUPERNATANT

DATE SAMPLED		Cr	Cu	Pb	Ni	Zn	Cd	Mn
June 4/74		10	12	9.9				
June 11/74		2.8	3.4	2.3				
June 25/74		4.0	4.5	.03				
July 2/74		5.1	6.7	6.1				
Sept. 10/74		1.3	1.6	1.2	.73			
Sept. 30/75		<.25	<.25	<.25	<.20	<.25	<.10	.25
AVERAGE:		3.9	4.7	3.3	.47	*.25	*.10	*.25
RANGE:	Low	.25	.25	.03	.20			
	High	10	12	9.9	.73			

TABLE 14. (CONT'D)

PRIMARY EFFLUENT (South Plant)

DATE SAMPLED	Cr	Cu	Pb
June 18/74	.56	1.2	.20
AVERAGE:	*.56	*1.2	*.20

PRIMARY EFFLUENT (North Plant)

DATE SAMPLED	Cr	Cu	Pb	Zn	Cd	Ni
June 18/74	.64	.98	.21			
July 16/74	.80	.96	.34			
July 8/75	.14	.14	.09	.29	<.01	.23
July 14/75		.12	.14	.34	<.01	.33
July 29/75		.04	.15	.19	<.01	.14
July 30/75		.03	.07	.20	<.01	.14
AVERAGE:	.53	.38	.17	.26	.01	.21
RANGE: Low	.14	.03	.07	.19	.01	.14
High	.80	.98	.34	.34	.01	.33

MIXED LIQUOR (South Plant)

DATE SAMPLED	Cr	Cu	Pb
June 18/74	9.0	14	11
July 2/74	6.8	4.6	4.6
July 16/74	1.3	4.9	7.7
AVERAGE:	5.7	7.8	7.8
RANGE: Low	1.3	4.6	4.6
High	9.0	14	11

TABLE 14. (CONT'D)

MIXED LIQUOR (North Plant)

DATE SAMPLED	Cr	Cu	Pb	Ni	Zn	Cd	Mn
June 18/74	7.4	11	7.6				
July 2/74	44	3.5	4.0				
July 16/74	1.3	4.9	7.7				
Sept. 30/75	<.10	1.2	<.25	.20	1.3	<.10	.60
AVERAGE:	13.2	5.2	4.9	*.20	*1.3	*.10	*.60
RANGE: Low	.10	1.2	.25				
High	44	11	7.7				

SECONDARY DIGESTER SUPERNATANT

DATE SAMPLED	Cr	Cu	Pb
June 4/74	3.4	3.8	3.6
June 1/74	12	16	12
June 25/74	38	56	.05
July 2/74	1.7	2.2	1.6
Jan. 7/75	39	47	
AVERAGE:	19	25	4.3
RANGE: Low	1.7	2.2	.05
High	39	56	12

SECONDARY EFFLUENT (South Plant)

DATE SAMPLED	Cr	Cu	Pb	Ni
July 16/74	.30	.22	.16	
Aug. 27/74	.14	.08	.15	.26
Sept. 3/74	.09	.13	.06	.35
Sept. 10/74	.55	.36	.11	
AVERAGE:	.27	.20	.12	.31
RANGE: Low	.09	.08	.06	.26
High	.55	.36	.16	.35

TABLE 14. (CONT'D)

SECONDARY EFFLUENT (North Plant)

DATE SAMPLED	Cr	Cu	Pb	Ni	Zn	Cd
June 18/74	.53	.72	.14			
July 16/74	.26	.21	.08			
Aug. 27/74	.12	.11	.11			
Sept. 3/74	.12	.08	.12	.34		
Sept. 10/74	.43	.33	.10			
July 8/75	.05	.04	.03	.19	.19	.01
July 14/75		.05	.02	.26	.17	.01
July 29/75		.02	.03	.10	.04	.01
AVERAGE:	.25	.20	.08	.22	.13	.01
RANGE: Low	.05	.02	.02	.10	.04	.01
High	.53	.72	.14	.34	.19	.01

TABLE 15. ANALYTICAL DATA FOR DURHAM REGIONAL MUNICIPALITY - NEWCASTLE, SOPER CREEK WPCP

OPERATED BY: Municipality

ACTUAL POPULATION: 12,250

POPULATION SERVED BY TREATMENT FACILITY: 12,112

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.1 mgd

ANALYTICAL DATA:

RAW SLUDGE #1

DATE SAMPLED		Zn	Pb	Fe
Jan. 7/75		60	17	
Mar. 4/75		52	21	720
Apr. 24/75		44	18	490
May 13/75		74	2.4	2400
June 10/75		59	11	680
July 8/75		44	19	530
Aug. 5/75		45	29	580
AVERAGE:		54	17	900
RANGE:	Low	44	2.4	490
	High	79	29	2400

RAW SLUDGE # 2

DATE SAMPLED		Zn	Pb	Fe
Jan. 7/75		23	12	
Mar. 4/75		39	21	1100
Apr. 24/75		28	12	470
May 13/75		31	13	410
June 10/75		30	12	460
July 8/75		18	9.4	260
Aug. 5/75		20	2.1	140
AVERAGE:		27	12	473
RANGE:	Low	18	2.1	140
	High	39	21	1100

TABLE 15. (CONT'D)

DIGESTED SLUDGE

DATE SAMPLED		Zn	Pb	Fe
Jan. 7/75		34	5.4	
Mar. 4/75		25	13	300
Apr. 24/75		34	9.4	470
May 13/75		31	17	410
June 10/75		24	15	340
July 8/75		36	14	380
Aug. 5/75		29	2.0	230
AVERAGE:		30	11	355
RANGE:	Low	24	2.0	230
	High	36	17	470

TABLE 16. ANALYTICAL DATA FOR DURHAM REGIONAL MUNICIPALITY - OSHAWA, HARMONY CREEK NO. 1 WPCP

OPERATED BY: Municipality

ACTUAL POPULATION: 106,345

POPULATION SERVED BY TREATMENT FACILITY: 67,000

TYPE OF TREATMENT: Biological Filtration

AVERAGE DAILY FLOW: 6.6 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Zn	Cu	Ni	Cr	Fe	Pb
July 2/74	.37	.07	.14	.32	1.6	.13
AVERAGE:	*.37	*.07	*.14	*.32	*1.6	*.13

RAW SLUDGE

DATE SAMPLED	Cu	Cr	Zn	Ni	Pb	Fe	H_2S
June 4/74	22	130					
June 4/74	13	83					
July 2/74	20	100	82	13	65	920	
July 2/74	19	10	26	20	12	410	
Aug. 6/74	16	38	63	9.2	42	425	67
Aug. 6/74	22	5.0	40	2.4	9.2	395	125
Sept. 3/74	28	65	79	9.8	43	490	
Sept. 3/74	27	6.5	31	1.7	15	330	
Oct. 1/74	1.8	9.0	4.2	.67	2.7	84	250
Oct. 1/74	1.9	.35	2.7	.10	.21	24	225
Nov. 5/74	50	140	180	56	8.5	4400	48
Nov. 5/74	21	4.2	26	1.0	9.2	250	16
AVERAGE:	20	49	53	11	21	773	122
RANGE: Low	1.8	.35	2.7	.10	.21	24	16
High	50	140	180	56	65	4400	250

TABLE 16. (CONT'D)

FINAL DIGESTED SLUDGE

DATE SAMPLED	H_2S	Zn	Cu	Cr	Ni	Fe	Pb	Cd
June 4/74	500	460	91	360	100	2700		
July 4/74	800	19	40	290	32	4300	100	
Aug. 6/74	270	255	45.4	190	38	2485	120	
Sep. 3/74		160	44	120	27	3200	130	
Oct. 1/74	1000	19	5.2	18	2.9	480	11	
Nov. 5/74	30	230	52	320	54	5500	98	
Jan. 7/75		230	56	390	70	7300	120	.60
Feb. 4/75		12	5.9	10	5.5	400	79	.07
Mar. 4/75		210	55	550	65	5700	71	.67
Apr. 1/75		25	7.4	54	6.7	200	3.4	<.20
Apr. 9/75		100	28	230	24		52	
May 13/75		240	48	520	48	3300	37	.65
June 25/75		160	34	150	29	2000	49	.50
July 8/75		230	48	360	45	2000	34	.70
Aug. 4/75		240	46	240	54	2000	75	.55
Sep. 2/75		130	31	210	40	1700	39	.35
Oct. 15/75		280	57	410	100	1700	120	.50
AVERAGE:	520	177	41	260	44	2810	71	.48
RANGE: Low	30	12	5.2	120	2.9	200	3.4	.20
High	1000	460	91	550	100	7300	130	.70

TABLE 17. ANALYTICAL DATA FOR DURHAM REGIONAL MUNICIPALITY - OSHAWA, HARMONY CREEK NO. 2 WPCP

OPERATED BY: Municipality

ACTUAL POPULATION: 106,345

POPULATION SERVED BY TREATMENT FACILITY: 29,000

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 3.4 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Zn	Cu	Ni	Cr	Fe	Pb
July 2/74	.29	.15	.05	.12	2.7	.11
AVERAGE:	*.29	*.15	*.05	*.12	*2.7	*.11

TABLE 18. ANALYTICAL DATA FOR DURHAM REGIONAL MUNICIPALITY - WHITBY, PRINGLE CREEK WPCP

OPERATED BY: Municipality

ACTUAL POPULATION: 27,000

POPULATION SERVED BY TREATMENT FACILITY: 16,146

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 2.5 mgd

ANALYTICAL DATA:

#1 RAW SLUDGE

DATE SAMPLED	Cr	Cu	Pb	Fe	pH	P
Oct. 2/74	1.8	4.8	1.9	14		
Nov. 6/74	3.1	5.0		9.7	5.7	420
Dec. 4/74	4.4	5.3	39	15		
Jan. 8/75	49		46	250		
Feb. 12/75	51	85	71	140		
Mar. 5/75	37	63				
Apr. 2/75	36	59	81	290		
May 14/75	25	38	46			
July 9/75	66	71	64	170		
Sep. 3/75	61	54	52	250		
Oct. 1/75	34	33	19	89		
AVERAGE:	31	42	42	123	*5.7	*420
RANGE: Low	1.8	4.8	1.9	9.7		
High	66	85	81	290		

#2 RAW SLUDGE

DATE SAMPLED	Cr	Cu	Pb	Fe	pH	P
Oct. 2/74	1.9	6.2	1.9	14		
Nov. 6/74	3.2	4.6		8.7	5.7	440
Dec. 4/74	88	97	70	250		
Jan. 8/75	89		48	330		
Feb. 12/75	33	55	55	130		
Mar. 5/75	26	35	41	240		
Apr. 2/75	23	36	65	190		
May 14/75	59	77	99			
July 9/75	66	75	65	210		
Sep. 3/75	57	49	35	290		
Oct. 1/75	38	29	26	110		
AVERAGE:	44	46	51	177	*5.7	*440
RANGE: Low	1.9	4.6	1.9	8.7		
High	89	97	99	330		

TABLE 18. (CONT'D)

DIGESTED SLUDGE

DATE SAMPLED	Cr	Cu	Pb	Fe	pH	P
Oct. 2/74	3.8	7.0	3.2	14		
Nov. 6/74	42	66		170	7.3	280
Dec. 4/74	52	77	24	160		
Jan. 8/75	64	51		300		
Feb. 12/75	56	69	56	180		
Mar. 5/75	53	81	53	240		
Apr. 2/75	40	67	60	200		
May 14/75	46	78	50			
July 9/75	67	99	93	290		
Sep. 3/75	91	65	55	460		
Oct. 1/75	28	52	5.9	92		
AVERAGE:	49	65	45	211	*7.3	*280
RANGE: Low	3.8	7.0	3.2	14		
High	91	99	93	460		

TABLE 19. ANALYTICAL DATA FOR THE MUNICIPALITY OF ESPANOLA

OPERATED BY:	MOE
ACTUAL POPULATION:	6,045
POPULATION SERVED BY TREATMENT FACILITY:	5,700
TYPE OF TREATMENT:	Primary Sedimentation
AVERAGE DAILY FLOW:	.70 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED		Cr	Mn
July 9/75		1.1	2.0
July 9/75		1.3	3.6
AVERAGE:		1.2	2.8
RANGE:	Low	1.1	2.0
	High	1.3	3.6

TABLE 20. ANALYTICAL DATA FOR THE MUNICIPALITY OF FERGUS

OPERATED BY: MOE

ACTUAL POPULATION: 5,800

POPULATION SERVED BY TREATMENT FACILITY: 5,600

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .60 mgd

ANALYTICAL DATA:

FINAL CLARIFIER #1 EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 8/74	.14	.04	.10	.04	<.01	.03	<.02
AVERAGE:	*.14	*.04	*.10	*.04	*.01	*.03	*.02
RANGE: Low							
High							

FINAL CLARIFIER #2 EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 8/74	.07	<.03	.08	.03	<.01	.02	<.02
Average:	*.07	*<.03	*.08	*.03	*<.01	*.02	*<.02
RANGE: Low							
High							

TABLE 21. ANALYTICAL DATA FOR THE MUNICIPALITY OF GANANOQUE

OPERATED BY: Municipality

ACTUAL POPULATION: 5,212

POPULATION SERVED
BY TREATMENT FACILITY: 5,110

TYPE OF TREATMENT: Aerated Lagoon

AVERAGE DAILY FLOW: 1.9 mgd

ANALYTICAL DATA:

MAIN PUMPING STATION (INFLUENT)

DATE SAMPLED	Ni	Cu	Zn	Cd
July 30/74	<.02	.29	1.0	.01
July 31/74	<.02	.28	1.2	.01
Aug. 2/74	<.04	.25	.41	<.01
Aug. 3/74	<.04	.18	.36	<.01
Aug. 3/74	<.04	.20	.45	<.01
Aug. 4/74	<.04	.16	.24	<.01
Aug. 4/74	<.04	.30	.73	<.01
Aug. 5/74	.05	1.06	2.3	<.01
Aug. 5/74	.08	.38	.79	.03
Aug. 6/74	.06	.26	.40	<.01
Aug. 14/74	.73	.43	1.1	.17
Aug. 15/74	.14	.50	.82	.11
Aug. 16/74	<.04	.15	.28	<.01
Aug. 17/74	.31	.50	1.4	.11
Aug. 18/74	.05	.46	.96	.07
Aug. 19/74	.77	.32	.83	.24
Aug. 20/74	<.04	<.03	.04	<.01
Aug. 22/74	1.4	.56	1.0	1.3
Aug. 23/74	1.6	.35	1.2	.50
Aug. 24/74	1.1	.19	.36	.02
Aug. 25/74	.18	.20	.19	.01
Aug. 26/74	.26	.05	.30	.03
Aug. 29/74	2.1	.25	.75	.11
AVERAGE:	.40	.32	.74	.12
RANGE: Low	.02	.03	.04	.01
High	2.1	1.06	2.3	1.3

TABLE 22. ANALYTICAL DATA FOR THE MUNICIPALITY OF GEORGETOWN

OPERATED BY: MOE

ACTUAL POPULATION: 17,053

POPULATION SERVED
BY TREATMENT FACILITY: 17,800

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.7 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	Cl^-	K	Na	P	pH
1974	12	900	24	24	2.1	22	1.0	7	280	1500	190	1.1	59	68	100	500	7.5
AVERAGE:	* 12	* 900	* 24	* 24	* 2.1	* 22	* 1.0	* 7	* 280	* 1500	* 190	* 1.1	* 59	* 68	* 100	* 500	* 7.5
RANGE: Low																	
High																	

TABLE 23. ANALYTICAL DATA FOR THE MUNICIPALITY OF GODERICH

OPERATED BY:	Municipality
ACTUAL POPULATION:	7,000
POPULATION SERVED BY TREATMENT FACILITY:	7,000
TYPE OF TREATMENT:	Conventional Activated Sludge
AVERAGE DAILY FLOW:	1.2 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	NTA
Oct. 14/75	.60
AVERAGE:	*.60
RANGE: Low	
High	

TABLE 24. ANALYTICAL DATA FOR THE MUNICIPALITY OF GUELPH

OPERATED BY: Municipality

ACTUAL POPULATION: 66,100

POPULATION SERVED BY TREATMENT FACILITY: 63,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 8.5 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Al	Cr	Cu	Zn	Fe
June 13/74	.66	.64	.71	1.3	5.2
July 10/74	1.6	.52	.35	1.3	
Aug. 21/74	1.6	.70	.70	1.3	
Sept. 5/74	3.3	1.1	.79	2.0	5.7
Sept. 25/74	1.6	.56	.38	1.4	
Oct. 9/74	.74	1.2	.34	1.0	
Oct. 23/74	3.2	.81	.43	1.9	10
Dec. 4/74	1.2	.60	.44	1.4	
Jan. 8/75	2.7	.62	.80	1.1	
Jan. 22/75	1.9	.80	.66	1.0	
Feb. 12/75	<.40	<.40	.50		5.4
Apr. 24/75	.74	.65	.96	1.2	
May 8/75	.56	.39	.48	1.1	5.1
May 22/75	.76	.52	.50	1.2	
June 5/75	.25	.25	.30	.94	
July 24/75	.97	.38	.25	1.7	
Sept. 4/75	5.0	.55	.69	3.1	
Sept. 18/75	8.0	.60	.68	1.1	
Oct. 2/75	2.5	.75	.79	.92	1.6
Oct. 16/75	1.4	.59	.53	1.1	
AVERAGE:	2.0	.63	.56	1.4	5.5
RANGE: Low	.25	.25	.25	.92	1.6
High	8.0	1.2	.96	3.1	10

TABLE 24. (CONT'D)

PRIMARY EFFLUENT #2 PLANT

DATE SAMPLED	Al	Cr	Cu	Zn	Fe
June 13/74	2.3	.48	.33	1.0	1.8
July 10/74	2.8	.52	.33	1.2	
Aug. 21/74	.35	<.03	.11	.51	
Sept. 5/74	2.2	.46	.35	1.1	2.3
Oct. 9/74	3.3	1.0	.46	1.6	
Oct. 23/74	.64				
Dec. 4/74	1.5	.33	.32	.95	
Jan. 8/75	.66	.08	.11	.26	
Jan. 22/75	1.5	.47	.36	.73	
Feb. 12/75	<.40	<.40	<.50	.50	1.6
Apr. 24/75	.90	.52	.51	1.2	
May 8/75	1.5	.60	.64	1.9	11
May 22/75	.79	.46	.36	1.2	
June 5/75	.65	.29	.33	1.0	
July 24/75	3.3	.50	.50	2.1	
Sept. 4/75	2.1	.25	.40	2.0	
Sept. 18/75	7.5	1.2	.31	2.5	
Oct. 3/75	2.4	.57	.57	.97	1.6
Oct. 16/75	2.9	.69	.73	1.5	
AVERAGE:	2.0	.49	.40	1.2	3.7
RANGE: Low	.35	.03	.11	.26	1.6
High	3.3	1.2	.73	2.5	11

TABLE 24. (CONT'D)

PRIMARY EFFLUENT #3 PLANT

DATE SAMPLED	Al	Cr	Cu	Zn	Fe
June 13/74	3.5	.62	.39	1.4	2.6
July 10/74	3.5	.52	.33	1.2	
Aug. 2/74	.89	.03	.09	.36	
Sept. 5/74	2.7	.43	.32	1.1	2.2
Sept. 25/74	2.8	.56	.44	1.2	
Oct. 9/74	1.5	.35	.22	.89	
Oct. 23/74	2.5				
Dec. 4/74	1.9	.40	.28	.86	
Jan. 8/75	3.5	.50	.43	1.0	
Jan. 22/75	1.5	.47	.36	.73	
Feb. 12/75	<.40	<.40	<.50	.70	4.3
Apr. 24/75	.98	.44	.41	.92	
May 8/75	2.2	.70	.62	1.6	6.5
May 22/75	2.5	.91	.80	2.3	
June 5/75	.50	.25	.29	.91	
July 24/75	4.8	.58	.53	1.9	
Sept. 4/75	2.1	.25	.40	2.0	
Sept. 18/75	3.8	.54	.57	1.4	
Oct. 2/75	4.0	.57	.58	1.1	1.5
Oct. 16/75	1.8	.32	.36	.94	
AVERAGE:	2.4	.47	.42	1.2	3.4
RANGE: Low	.40	.03	.09	.36	1.5
High	4.8	.91	.80	2.3	6.5

TABLE 24. (CONT'D)

PRIMARY DIGESTOR #2 PLANT

DATE SAMPLED	Al	Cr	Fe	Cu	Zn	Cd	Pb	Mn	Hg	Ni
June 27/74	800	100	600	66	180	4.5	42	5.8	.008	2.4
Jan. 9/75	97	120	1800	85	120	6.0	7.2	5.1	.063	3.9
Feb. 13/75	260	69	860	43	46	2.3	53	2.6	.082	2.3
Feb. 17/75	320	74	1200	71	150	3.9	59	6.0	.012	2.9
Apr. 24/75	560	180	3800	110	210	5.9	100	1.3	.020	4.9
May 8/75	260	120	3200	110	210					
May 22/75	16	6.2	160	5.6	14	.27	4.7	.47	.022	.20
June 5/75	420	110				4.7		7.0		3.1
June 19/75	700	130	870	100	260	5.2	64	7.2	.030	4.0
July 24/75	780	89	640	91	220	20	46	6.0		3.1
Aug. 28/75	1200	86	430	85	200	21		8.0	.005	2.0
Sep. 18/75	1800	110	980	78	170	11	36	9.4	.009	1.5
Oct. 8/75	930	53	330	61	110	6.6		4.1	.041	1.5
Oct. 16/75	1100	82	850	95	160	11	36	5.3	.001	2.0
AVERAGE:	660	95	1209	77	158	7.9	45	5.3	.027	2.6
RANGE: Low	16	6.2	160	5.6	14	.27	4.7	.47	.005	.20
High	1800	180	3800	110	260	21	100	9.4	.082	4.9

PRIMARY DIGESTOR #3 PLANT

DATE SAMPLED	Al	Cr	Fe	Cu	Zn	Cd	Pb	Mn	Hg	Ni
June 13/74	1300	140		100	240	7.3	55	10	.084	3.8
July 11/74	1800	190	1500	120	320	12	64	7.8	.002	4.5
Sept. 26/74	380	60	110	81	120	3.8	20	4.4	.036	1.3
Oct. 24/74	1100	130	930	97	220	6.3	56	16	.013	3.9
Dec. 4/74	740	120	800	100	150	5.6	7.0	8.3	.086	3.8
Jan. 22/75	97	13	170	9.8	15	.68	59	.75	.125	.40
Mar. 17/75	500	81	1100	120	210	4.8	76	7.9	.170	2.4
Apr. 24/75	690	140	3400	120	260	5.6	110	13	.023	4.4
May 8/75	420	150	3700	130	250					
May 22/75	28	7.7	220	7.5	18	.34	6.4	.70	.010	.26
June 5/75	420	150		150	350	6.7	8.2	13	.015	5.4
June 19/75	700	170	2100	135	344	6.3	95	12	.010	5.1
July 24/75	840	120	1200	110	250	13	50	7.7		3.7
Aug. 28/75	1300	110	620	110	250	28			.005	3.0
Sept. 18/75	1800	120	1200	130	300	27	55	11	.006	3.3
Oct. 8/75	1500	110	560	110	240	18		9.1	.003	2.8
Oct. 16/75	1200	97	1100	120	230	14	51	7.1	.099	2.9
AVERAGE	872	112	1247	103	222	10.0	51	8.6	.046	3.2
RANGE: Low	28	7.7	110	7.5	15	.34	6.4	.70	.002	.26
High	1800	190	3700	150	350	28	110	16	.170	5.4

TABLE 24. (CONT'D)

AERATION TANK #1 PLANT

DATE SAMPLED	Al	Cr	Fe	Cu	Zn
Apr. 24/75	7.9	4.3	96	3.7	5.3
May 8/75	8.0	3.4	110	3.2	7.6
May 22/75	5.8	3.5	62	3.4	8.0
June 5/75	49	7.4		6.3	12
June 19/75	76	5.9	36	4.7	15
July 24/75	93	5.6	31	5.1	12
AVERAGE:	40	5.0	67	4.4	10
RANGE: Low	5.8	3.4	31	3.2	5.3
High	93	7.4	110	6.3	15

AERATION TANK #2 WEST

DATE SAMPLED	Al	Cr	Fe	Cu	Zn
June 27/74	7.8	5.6	18	2.2	4.6
Aug. 28/74	95	9.0	32	7.2	12
Sept. 5/74	50	3.7	13	2.6	6.7
Sept. 26/74	120	7.5	36	6.0	11
Oct. 24/74	180	9.5	48	5.6	14
Dec. 4/74	93	5.5	35	4.0	9.1
Jan. 22/75	730	72	67	55	61
May 22/75	5.3	3.0	54	2.7	6.1
AVERAGE:	160	6.3	38	11	16
RANGE Low	5.3	3.0	13	2.2	4.6
High	730	72	67	55	61

AERATION TANK #2 PLANT EAST

DATE SAMPLED	Al	Cr	Fe	Cu	Zn
June 13/74	70	3.9	10		4.0
July 11/74	41	3.9	17	3.0	8.5
Sept. 5/74	150	7.5	28	5.2	12
Jan. 9/75	88	5.3	28	3.8	6.3
Feb. 13/75	39	4.3	21	3.0	4.3
Apr. 24/75	10	5.4	99	4.4	6.8
May 8/75	9	5.0	210	5.2	7.6
June 5/75	62	5.5		4.8	8.6
June 19/75	72	5.0	25	3.6	11

TABLE 24. (CONT'D)

AERATION TANK #2 PLANT EAST (CONT'D)

DATE SAMPLED	Al	Cr	Fe	Cu	Zn
July 24/75	87	6.1	35	5.6	15
Oct. 8/75	180	10	32	9.7	17
Oct. 16/75	84	4.7	24	4.8	6.0
AVERAGE:	74	5.6	48	4.8	8.9
RANGE: Low	9.0	3.9	10	3.0	4.0
High	180	10	210	9.7	17

AERATION TANK #3 WEST

DATE SAMPLED	Al	Fe	Cr	Cu	Zn
June 27/74	1.4	1.9	.30	.08	.08
Sept. 26/74	110	47	6.5	6.0	12
Oct. 24/74	5.5	42	6.5	3.9	12
Dec. 4/74	120	66	8.0	6.6	17
Jan. 22/75	840	27	87	60	97
May 22/75	20	84	7.3	6.3	13
July 24/75	90	40	5.6	5.9	18
AVERAGE:	170	44	17	13	24
RANGE Low	1.4	1.9	.30	.08	.08
High	840	84	87	60	97

AERATION TANK #3 PLANT EAST

DATE SAMPLED	Al	Cr	Fe	Cu	Zn
June 13/74	63	3.7	11		5.0
July 11/74	42	5.2	12	4.0	13
Jan 9/75	73	6.4	42	4.5	8.9
Apr. 24/75	15	5.4	110	4.1	7.4
June 8/75	21	7.0	200	6.6	15
June 9/75		4.7		4.4	85
June 19/75	70	6.0	45	4.6	13
Oct. 3/75	240	11	43	9.7	16
Oct. 16/75	130	7.4	62	7.8	13
AVERAGE:	82	6.3	66	5.7	20
RANGE: Low	15	3.7	11	4.0	5.0
High	240	11	200	9.7	85

TABLE 24. (CONT'D)

SECONDARY DIGESTOR #2 PLANT

DATE SAMPLED	Al	Cr	Fe	Cu	Zn	Cd	Pb	Mn	Hg	Ni
June 27/74	430	270	3600	300	650	13	160	17	.037	10
Jan. 9/75	140	240	2000	170	270	13	110	9.5	.023	7.4
Feb. 13/75	260	69	860	43	46	2.3	53	2.6	.094	2.3
Apr. 24/75	1900	240	2100	180	260	4.6	59	9.7	.007	3.6
May 8/75	600	160	3700	140	260					
May 22/75	31	8.1	220	7.3	17	.38	5.0	.64	.010	.30
June 5/75	530	190		160	460	7.3	9.5	13	.009	5.4
June 19/75	700	170	1700	135	310	6.4	99	9.7	.010	5.4
July 24/75	1200	160	1600	210	460	24	14	13		7.2
Aug. 28/75	1900	410	1700	420	680	28		10	.440	2.6
Sep. 18/75	1900	140	1300	150	340	32	65	12	.012	3.7
Oct. 8/75	1600	130	610	140	300	22		11	.010	3.6
Oct. 8/75	1700	120	1400	160	310	16	76	8.8	.022	4.2
AVERAGE:	992	178	1733	170	336	14	65	9.8	.06	4.5
RANGE: Low	31	8.1	220	7.3	17	.38	5.0	.64	.007	.30
High	1900	410	3700	420	680	32	160	17	.440	10

SECONDARY DIGESTOR #3 PLANT

DATE SAMPLED	Al	Cr	Fe	Cu	Zn	Cd	Pb	Mn	Hg	Ni
June 13/74	780	65		45	97	3.3	75	4.4	.114	2.0
June 27/74	430	270	3600	300	650	13	160	17	.037	10
July 11/74	2000	620	6700	530	1200	22	170	36	.018	18
Sept. 26/74	630	85	420	120	230	6.4	51	6.8	.051	2.5
Oct. 24/74	1100	140	950	110	250	8.3	8.8	13	.012	4.0
Dec. 4/74	840	160	760	130	160	5.7	77	10	.069	4.8
Jan. 22/75	97	13	170	9.8	15	68	59	.75	.149	.40
Apr. 24/75	1100	170	3800	170	360	8.4	94	15	.015	6.6
May 8/75	420	150	3700	130	250					
May 22/75	37	11	280	10	23	.49	7.6	.96	.010	.39
June 5/75	480	170		160	500	7.2	89	14	.015	6.1
June 19/75	710	190	2200	160	390	7.2	17	15	.010	5.8
July 24/75	970	140	700	140	330	16	82	10		5.4
Aug. 28/75	1900	150	830	140	310	38		13	.020	5.0
Sept. 18/75	1800	130	1400	150	330	34	65	12	.013	4.0
Oct. 8/75	1500	130	560	140	290	22		11	.002	3.6
Oct. 16/75	1800	120	1500	150	290	17	66	9.4	.002	3.6
AVERAGE:	976	160	b949	b64	440	b8	84	b3	M547	6Mb
RANGE: Low	37	11	170	9.8	15	.49	7.6	.75	.002	.39
High	2000	620	6700	530	1200	68	170	36	.149	6.6

TABLE 24. (CONT'D)

DIGESTOR SUPERNATANT #2 PLANT

DATE SAMPLED	Al	Cr	Fe	Cu	Zn	Cd	Pb	Mn	Hg	Ni
June 27/74	560	50	390	30	85	1.7	23	2.6	.021	.98
Oct. 24/74	670	60	480	50	96	4.2	26	6.9.	.004	1.9
Jan. 9/75	880	98		85	200	6.6	46		.046	3.2
Feb. 13/75	1000	67	1000	68	85	4.0	52	4.3	.092	2.2
Apr. 24/75	480	110	2700	97	210	4.6	59	9.7	.040	3.6
May 8/75	380	100	2100	98	190					
May 22/75	16	5.8	140	5.6	14	.25	4.4	.46	.050	.18
June 5/75	370	100		90	220	4.7	6.0	6.5	.080	3.6
June 19/75	620	100	720	64	185	2.9	43	5.0	.010	2.9
July 24/75	760	86	620	86	210	19	45	6.0		3.2
Aug. 28/75	1800	110	570	110	250	28		25	.440	14
Sept. 18/75	960	66	640	110	240	14	48	5.7	.018	2.0
Oct. 8/75	1100	63	370	67	120	7.8		4.8	.055	1.6
Oct. 16/75	880	67	680	72	130	8.9	32	4.0	.029	1.8
AVERAGE:	748	77	868	74	160	8.2	35	6.8	.074	3.2
RANGE: Low	16	5.8	140	5.6	14	.25	4.4	.46	.004	.18
High	1800	110	2700	110	250	28	59	25	.440	14

DIGESTOR SUPERNATANT #3 PLANT

DATE SAMPLED	Al	Cr	Fe	Cu	Zn	Cd	Pb	Mn	Hg	Ni
June 13/74	340	38		33	77	1.8		3.2	.046	1.3
Julyll/74	1100	120	930	72	190	6.9	1.1	5.3	.001	2.4
Sept. 26/74	330	27	180	33	63	2.5	17	2.0	.020	.35
Oct. 24/74	670	60	480	50	96	4.2	26	6.9	.004	1.9
Dec. 4/74	410	46	290	42	73	2.3	22	3.7	.029	1.6
Jan. 22/75	25	3.2	26	2.2	3.7	19	16	18	.065	.16
Apr. 24/75	620	120	2200	100	220	5.0	82	9.9	.013	3.7
May 8/75	480	130	2900	120	210					
May 22/75	23	6.5	1700	6.3	15	.29	.27	.60	.030	.23
June 5/75	420	150		120	310	5.7	91	10	.005	5.0
June 19/75	780	160	1900	130	320	5.8	89	11	.015	4.9
July 24/75	720	92	1000	91	210	12	44	6.3		3.5
Sept. 18/75	500	43	380	46	110	9.9	21	3.8		1.1
Oct. 8/75	1500	120	610	130	270	20		10	.071	3.4
Oct. 16/75	990	74	830	88	170	11	37	5.6	<.001	2.3
AVERAGE:	682	91	1117	81	178	7.3	45	6.5	.025	2.8
RANGE: Low	23	3.2	26	2.2	3.7	.29	.27	.60	.001	.23
High	1500	160	2900	130	320	20	91	18	.071	5.0

TABLE 24. (CONT'D)

FINAL EFFLUENT #1 Plant

DATE SAMPLED	Al	Cr	Cu	Zn	Fe
June 19/75	.29	.05	.03	.16	
Feb. 12/75	<.04	<.40	<.50	<.50	<.60
Apr. 24/75	.16	.07	.09	.50	
May 8/75	.09	.06	.07	.91	.65
May 22/75	.11	.04	<.03	.40	
June 5/75	.22	.07	.07	.46	
June 19/75	.29	.05	.03	.16	
July 24/75	<.05	<.10	<.05	.08	
Sept. 18/75	.28	<.05	<.05	.25	
Oct. 16/75	.42	.07	.08	.38	
AVERAGE:	.20	.10	.10	.38	.63
RANGE: Low	.04	.04	.03	.08	.60
High	.42	.40	.50	.91	.65

FINAL EFFLUENT #2 PLANT

DATE SAMPLED	Al	Cr	Cu	Zn	Fe
June 13/74	.73	<.04	<.05	.53	.18
July 10/74	1.0	<.03	<.05	.41	
Aug. 21/74	1.4	.03	.10	.45	
Sept. 5/74	.57	<.04	<.05	.33	.38
Sept. 25/74	1.1	.10	.06	.40	
Oct. 9/74	1.1	<.14	<.10	.68	
Oct. 23/74	.90				
Dec. 4/74	.59	<.07	.07	.28	
Feb. 7/75	.64	.05	.09	.46	
Feb. 12/75	<.40	<.40	<.50	<.50	<.60
Apr. 24/75	.07	.07	.10	.72	
May 8/75	.04	<.04	.11	1.2	.96
May 22/75	.06	.05	.05	.44	
June 5/75	.39	<.04	.08	.49	
June 19/75	.60	<.02	.03	.23	
July 24/75	.52	<.05	.03	.18	
Sept. 4/75	.31	.05	.06	.48	
Sept. 18/75	1.0	<.12	<.13	.40	
Oct. 2/75	.60	<.03	.15	.53	.18
Oct. 16/75	.61	.04	.09	.48	
AVERAGE:	.63	.07	.10	.48	.46
RANGE: Low	.04	.02	.03	.18	.18
High	1.4	.40	.50	1.2	.96

TABLE 24. (CONT'D)

FINAL EFFLUENT #3 PLANT

DATE SAMPLED	Al	Cr	Cu	Zn	Fe
June 13/74	.77	<.04	<.05	.87	.31
July 10/74	.96	.04	.07	.58	
Sept. 5/74	1.1	<.04	<.05	.63	.29
Sept. 25/74	1.6	<.10	.08	.68	
Oct. 9/74	1.3	<.07	.08	.84	
Oct. 23/74	.19				
Dec. 4/74	.61	<.07	.14	.32	
Jan. 22/75	.63	.47	.06	.05	
Feb. 12/75	<.40	.70	<.40	<.50	.60
May 8/75	.08	<.04	.08	1.3	1.4
May 22/75	.10	<.04	.04	.48	
June 5/75	.73	<.04	.10	.63	
June 19/75	.72	<.02	.03	.39	
July 24/75	.81	<.05	.03	.34	
Sept. 18/75	.65	<.01	<.05	.41	
Oct. 3/75	1.2	.05	.11	.73	.48
Oct. 10/75	.47	.07	.05	.47	
AVERAGE:	.72	.12	.09	.58	.62
RANGE: Low	.08	.01	.03	.05	.29
High	.19	.70	.40	1.3	1.4

TABLE 25. ANALYTICAL DATA FOR THE HAMILTON-WENTWORTH REGIONAL MUNICIPALITY, HAMILTON

OPERATED BY: Municipality

ACTUAL POPULATION: 400,000

POPULATION SERVED BY TREATMENT FACILITY: 325,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 60.0 mgd

ANALYTICAL DATA:

PRIMARY EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	HCN
May 12/75	5.2	.84	.39	1.1	.02	1.6	.41	
May 12/75	5.2	.85	.34	1.1	.02	1.6	.41	
May 12/75	2.7	.40	.22	.56	.01	.80	.20	
May 19/75	.32	.08	.03	.08	<.01	.12	.06	
May 19/75	.87	.19	.06	.23	<.01	.26	.09	
May 19/75	2.9	.56	.10	.63	<.01	.85	.22	
July 31/75	11	1.6	.40	2.3	.04	3.9	.80	.30
July 31/75	8.4	1.2	.29	.39	.03	2.8	.58	.20
July 31/75	8.9	1.3	.29	2.0	.03	3.1	.60	.20
AVERAGE:	5.1	.78	.24	.93	.02	1.7	.37	.23
RANGE: Low	.32	.08	.03	.08	.01	.12	.06	.20
High	11	1.6	.40	2.3	.04	3.9	.80	.30

FINAL EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
May 12/75	.29	.07	.08	.07	<.01	.12	.07
May 12/75	.43	.08	.13	.11	<.01	.14	.09
May 12/75	.20	.04	.18	.05	<.01	.07	.07
May 19/75	.12	.04	.05	<.01	<.01	.04	.06
May 19/75	.15	.04	.04	.04	<.01	.06	.06
May 19/75	.03	<.01	.04	<.01	<.01	.05	.06
July 31/75	.06	.01	.03	.01	<.01	<.05	.09
July 31/75	.05	.01	.03	<.01	<.01	<.05	.09
July 31/75	.06	.02	.03	<.01	<.01	<.05	.09
AVERAGE:	.15	.04	.07	.04	.01	.07	.08
RANGE: Low	.03	.01	.03	.01	.01	.04	.06
High	.43	.08	.18	.11	.01	.14	.09

TABLE 26. ANALYTICAL DATA FOR THE MUNICIPALITY OF HUNTSVILLE

OPERATED BY: Province

ACTUAL POPULATION: 9,784

POPULATION SERVED BY TREATMENT FACILITY: 2,800

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .40 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	pH	P	Na	K	Cl^-
1974	110	360	11	10	.50	10	.30	8	190	500	150	.70	7.0	980	59	49	180
AVERAGE:	* 110	* 360	* 11	* 10	* .50	* 10	* .30	* 8	* 190	* 500	* 150	* .70	* 7.0	* 980	* 59	* 49	* 180

TABLE 27. ANALYTICAL DATA FOR THE MUNICIPALITY OF INGERSOLL

OPERATED BY: MOE

ACTUAL POPULATION: 8,015

POPULATION SERVED BY TREATMENT FACILITY: 7,700

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.0 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Fe
1974	45
AVERAGE:	*45
RANGE: Low	
High	

EFFLUENT

DATE SAMPLED	P	Fe
1974	500	7600
AVERAGE:	*500	*7600
RANGE: Low		
High		

EFFLUENT

DATE SAMPLED	Fe
1974	1.1
July 8/75	1.2
Aug. 19/75	1.7
Sep. 3/75	1.1
Sep. 16/75	1.6
Sep. 30/75	5.5
AVERAGE	2.0
RANGE: Low	1.1
High	5.5

TABLE 28. ANALYTICAL DATA FOR THE MUNICIPALITY OF KINGSTON

OPERATED BY: Municipality

ACTUAL POPULATION: 60,000

POPULATION SERVED BY TREATMENT FACILITY: 75,000

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 12 mgd

ANALYTICAL DATA:

SEDIMENTATION SLUDGE

DATE SAMPLED	Al	Pb
July 8/74	.11	2.2
AVERAGE:	*.11	*2.2
RANGE: Low		
High		

DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Al
Aug. 28/75	130	78	4.9	81	1.3	180	26	2100
AVERAGE:	*130	*78	*4.9	*81	*1.3	*180	*26	*2100
RANGE: Low								
High								

TABLE 29. ANALYTICAL DATA FOR KINGSTON TOWNSHIP

OPERATED BY: MOE

ACTUAL POPULATION: 21,641

POPULATION SERVED BY TREATMENT FACILITY: 10,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.5 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Cl^-	SO_4
1974	67	71
AVERAGE:	*67	*71

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	pH	P	Na	K	Cl^-
1974	9.0	600	96	7.0	4.2	18	1.0	23	880	3100	280	110	6.6	930	3	2	78
AVERAGE:	*9.0	*600	*96	*7.0	*4.2	*18	*1.0	*23	*880	*3100	*280	*110	*6.6	*930	*3	*2	*78

EFFLUENT

DATE SAMPLED	Cl^-	SO_4
1974	68	77
AVERAGE:	*68	*77

TABLE 30. ANALYTICAL DATA FOR THE MUNICIPALITY OF KIRKLAND LAKE

OPERATED BY: MOE

ACTUAL POPULATION: 14,500

POPULATION SERVED BY TREATMENT FACILITY: 14,000

TYPE OF TREATMENT: Contact Stabilization

AVERAGE DAILY FLOW: 2.0 mgd

ANALYTICAL DATA:

AEROBIC DIGESTER

DATE SAMPLED	Cu	Ni	Pb	Zn	Cd	Al	Cr	Mn	Fe	Co	As	Mg
July 6/75	46	.80	16	29	10	130	16	7.1	320	<.35	97	390
Aug. 4/75	18	.75	5.9	7.4	.08	260	1.5	32	370	.25	28	150
AVERAGE:	32	.78	11	18	5.0	195	8.8	20	345	.30	63	270
RANGE: Low												
High												

TABLE 31. ANALYTICAL DATA FOR THE MUNICIPALITY OF MARKHAM

OPERATED BY: MOE

ACTUAL POPULATION: 36,684

POPULATION SERVED BY TREATMENT FACILITY: 31,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.2 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Cu	Zn	Ni	HCN	Cr
Sept. 30/74	.32				
Oct. 18/74	.33				
Nov. 4/74	.68	.32			
Nov. 5/74	1.1	.42	<.07		
Nov. 7/74	1.7	.65			
Nov. 11/74	1.0	.36		<.01	.04
Nov. 12/74	1.2	.40			
Nov. 13/74	1.4	.41			
Nov. 14/74	.86	.27			
Nov. 15/74	.79	.32			
Nov. 20/74	.76	.31			
Nov. 21/74	1.4	.58			
Nov. 22/74	1.1	.48			
Nov. 23/74	5.7	2.3			
Nov. 24/74	2.0	.83			
Nov. 25/74	2.1	.91			
Nov. 28/74	1.1	.48			
Nov. 28/74	1.1	.48			
Nov. 29/74	.51	.24			
Nov. 30/74	1.6	.78			
Dec. 2/74	2.1	1.1			
Dec. 3/74	2.4	1.1			
Dec. 4/74	2.8	1.4			
Dec. 5/74	2.5	.89			
Dec. 6/74	.92	.42			
Jan. 22/75	.28	.10			
Jan. 30/75	.29	.16			
Feb. 18/75	.15	.25			
Feb. 18/75	.20	.13			
Feb. 19/75	.06	.08			
Fed. 19/75	.23	.12			

TABLE 31. (CONT'D)

DATE SAMPLED	Cu	Zn	Ni	HCN	Cr
Feb. 21/75	.28	.16			
Feb. 24/75	.33	.24			
Beb. 28/75	.48	.23			
Mar. 3/75	.51	.29			
Mar. 3/75	.20	.63			
Mar. 4/75	1.1	.45			
Mar. 5/75	1.1	.52			
Mar. 5/75	.08	.13			
Mar. 6/75	.28	.36			
Mar. 6/75	1.1	.54			
Mar. 7/75	.16	.19			
Mar. 7/75	.33	.20			
Mar. 13/75	.38	.48			
AVERAGE:	1.0	.49	*.07	*.01	*.04
RANGE: Low	.06	.08			
High	5.7	2.3			

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	pH
1974	110	360	17	65	.60	12	1.0	4	140	7
AVERAGE:	*110	*360	*17	*65	*.60	*12	*1.0	*4	*140	*
RANGE: Low										
High										

TREATED EFFLUENT

DATE SAMPLED	Cu	HCN	Zn	Ni
Oct. 18/74	.18	.03	.10	
Nov. 4/74	.16		.09	
Nov. 5/74	<.32		.19	<.04
Nov. 7/74	.27		.37	
Nov. 11/74		<.01		
Nov. 13/74	.16		.07	
Nov. 14/74	.21		.11	
Nov. 15/74	.16		.14	

TABLE 31. (CONT'D)

DATE SAMPLED	Cu	HCN	Zn	Ni
Nov. 20/74	.16		.11	
Nov. 21/74	.10		.06	
Nov. 22/74	.17		.10	
Nov. 23/74	.27		.18	
Nov. 24/74	.09		.08	
Nov. 25/74	.14		.09	
Nov. 28/74	.10		.16	
Nov. 29/74	.10		.07	
Nov. 30/74	.09		.11	
Dec. 2/74	.15		.11	
Dec. 3/74	.08		.07	
Dec. 4/74	.09		.06	
Dec. 5/74	.07		.16	
Dec. 6/74	.06		.14	
Jan. 22/75	.22		.08	
Jan. 23/75	.32		.18	
Jan. 30/75	.24		.15	
Feb. 13/75	.10		.07	
Feb. 18/75	.04		.50	
Feb. 19/75	.04		.32	
Feb. 19/75	.11		.07	
Feb. 21/75	.21		.15	
Feb. 24/75	.17		.15	
Feb. 28/75	.28		.12	
Mar. 3/75	.25		.17	
Mar. 4/75	.10		.05	
Mar. 5/75	.12		.07	
Mar. 5/75	.26		.54	
Mar. 6/75	.16		.53	
Mar. 6/75	.19		.11	
Mar. 7/75	.18		.47	
Mar. 8/75	.10		.27	
Mar. 13/75	.04		.74	
Mar. 14/75	.24		.18	
AVERAGE:	.16	.02	.18	.04
RANGE: Low	.04	.01	.05	.04
High	.32	.03	.74	.04

TABLE 32. ANALYTICAL DATA FOR THE MUNICIPALITY OF MEAFORD

OPERATED BY: MOE

ACTUAL POPULATION: 4,000

POPULATION SERVED BY TREATMENT FACILITY: 2,000

TYPE OF TREATMENT: Extended Aeration

AVERAGE DAILY FLOW: .70 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	NTA	Cl^-	SO_4	Ca
1974		48	38	72
Oct. 13/75	1.9			
AVERAGE:	*1.9	*48	*38	*72
RANGE: Low				
High				

FINAL EFFLUENT

DATE SAMPLED	Cl^-	SO_4	Ca
1974	54	30	51
AVERAGE:	*54	*30	*51
RANGE: Low			
High			

TABLE 33. ANALYTICAL DATA FOR THE MUNICIPALITY OF MIDLAND

OPERATED BY: MOE

ACTUAL POPULATION: 11,000

POPULATION SERVED BY TREATMENT FACILITY: 10,500

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 1.6 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	NTA
Oct. 7/75	4.5
AVERAGE:	*4.5

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	P	Hg	Ti	pH
June 3/74	85	630	6.2	25	230	34	.20	21	540	10000	550	1.2				
1974	68	660	64	30	254	24	.30	22	540	11000	540	1.3	21000	.019	64	7.3
AVERAGE:	77	645	35	28	242	29	.25	22	540	10500	545	1.3	*21000	*.019	*64	*7.3
RANGE: Low	68	630	6.2	25	230	24	.20	21	540	10000	540	1.2				
High	85	660	64	30	254	34	.30	22	540	11000	550	1.3				

FINAL EFFLUENT

DATE SAMPLED	NTA
Oct. 7/75	4.5
AVERAGE:	*4.5

TABLE 34. ANALYTICAL DATA FOR MOORE TOWNSHIP

OPERATED BY:	MOE
ACTUAL POPULATION:	7,000
POPULATION SERVED BY TREATMENT FACILITY:	3,000
TYPE OF TREATMENT:	Extended Aeration
AVERAGE DAILY FLOW:	.28 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Cl^-
1974	57
AVERAGE:	*57
RANGE: Low	
High	

TABLE 35. ANALYTICAL DATA FOR THE MUNICIPALITY OF NEWMARKET

OPERATED BY: MOE

ACTUAL POPULATION: 18,941

POPULATION SERVED BY TREATMENT FACILITY: 15,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.6 mgd

ANALYTICAL DATA:

RAW SEWAGE		PRIMARY EFFLUENT	
DATE SAMPLED	Mn	DATE SAMPLED	Mn
June 14/74	.12	June 14/74	.06
June 18/74	.13	June 18/74	.09
July 2/74	.17	July 2/74	.12
July 8/74	.17	July 8/74	.24
Apr. 9/75	.14	Apr. 9/75	.10
Apr. 12/75	.11	Apr. 12/75	.11
Apr. 14/75	.17	Apr. 14/75	.18
Apr. 16/75	.14	Apr. 16/75	.17
Apr. 23/75	.11	Apr. 23/75	.08
Apr. 26/75	.15	Apr. 26/75	.09
May 31/75	.12	May 31/75	.09
June 7/75	.15	June 7/75	.06
June 9/75	.12	June 9/75	.03
June 11/75	.12	June 11/75	.05
June 16/75	.18	June 16/75	.13
July 5/75	.14	July 5/75	.15
July 8/75	.17	July 8/75	.24
July 10/75	.16	July 10/75	.15
July 13/75	.28	July 13/75	.20
July 15/75	.09	July 15/75	.18
Aug. 13/75	.73	Aug. 13/75	.08
AVERAGE:	.18	AVERAGE:	.12
RANGE: Low	.09	RANGE: Low	.03
High	.73	High	.24

TABLE 35. (CONT'D)

FINAL EFFLUENT

DATE SAMPLED		Mn
June 18/74		.03
July 2/74		<.01
July 8/74		.02
Apr. 9/75		.09
Apr. 12/75		.05
Apr. 14/75		.04
Apr. 16/75		.03
June 7/75		.03
June 16/75		.05
July 5/75		<.01
July 8/75		.02
July 10/75		<.02
July 13/75		<.04
July 15/75		<.02
AVERAGE:		.03
RANGE:	Low	.01
	High	.09

TABLE 36. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY - GRIMSBY, MAIN PLANT

OPERATED BY: Municipality

ACTUAL POPULATION: 10,000

POPULATION SERVED BY TREATMENT FACILITY: 7,500

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .60 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
June 20/74				.04	<.01	.02	.06	
June 26/74	.10	.05	<.04	.05	<.01	.05	.07	
July 10/74	.09	.06	<.04	<.03	<.01	<.03	.07	
July 11/74	.12	.10	.04	.05	<.01	.02	.07	1.1
July 24/74	.06	.03	<.02	<.01	<.01		.11	
Aug. 7/74	.05	.04	<.04	.01	<.01	<.02	.05	
Aug. 14/74	.13	.04	<.04	.02	<.01	<.03	.06	
Aug. 21/74	.05	.05	<.04	<.01	<.01	<.03	.06	
Sept. 11/74	.13	.07	<.04	.03	<.01	<.02	.05	
Sept. 19/74	.06	.05	<.04	.01	<.01	<.04	.07	
Sept. 26/74	.04	.04	<.04	.04	<.01	<.05	.06	
Oct. 9/74	.16	.28	<.04	.03	<.01	<.04	.09	
Oct. 16/74	.07	.07	.04	<.01	<.01	<.04	.07	
Oct. 30/74	.13	.11	.05	.04	.01	<.04	.08	
Nov. 13/74	.12	.08	<.04	.02	<.01	<.04	.07	
Dec. 11/74	.09	.07	<.04	.03	<.01	<.04	.07	
Feb. 12/75	.14	.08	<.07	<.03	<.02	.07	.07	
Mar. 12/75	.58	.14	<.02	.06	<.02	<.04	.09	
Apr. 9/75	.09	.07	<.07	.03	<.02	<.05	.07	
Apr. 23/75	.12	.06	<.07	.03	<.02	<.05	.07	
May 14/75	.11	.07	<.02	.02	<.01		.02	
May 28/75	.10	.08	<.02	<.01	<.01	<.04	.06	
June 11/75	.05	.03	<.02	<.01	<.01	<.03	.06	
June 25/75	.11	.11	.01	<.01	<.01	<.02	.07	
July 8/75	.14	.05	<.02	.03	<.01	<.02	.01	
July 23/75	.12	.07	<.02	<.01	<.01	<.05	.07	
Aug. 13/75	.10	.06	<.02	.01	<.01	<.03	.06	
Aug. 27/75	.13	.05	.01	<.01	.01	<.03	.08	
Sept. 17/75	.12	.09	<.03	.03	<.01	<.05	.06	
Sept. 30/75	.09	.05	<.01	<.01	<.01	<.03	.07	
Oct. 15/75	.12	.09	<.03	<.02	<.01	<.06	.08	
AVERAGE:	.10	.07	.03	.02	.01	.04	.03	*1.1
RANGE: Low	.04	.03	.01	.01	.01	.02	.01	
High	.58	.28	.07	.05	.02	.07	.11	

TABLE 36. (CONT'D)

RAW SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
July 11/74	66	44	2.1	14	.35	3.0	21	880
AVERAGE:	*66	*44	*2.1	*14	*.35	*3.0	*21	*880
RANGE: Low								
High								

DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
July 11/74	79	93	3.6	30	.84	17	29	1400
AVERAGE:	*79	*93	*3.6	*30	*.84	*17	*29	*1400
RANGE: Low								
High								

FINAL EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
June 26/74	.10	.07	<.04	.05	<.01	.04	.09	
July 11/74	.16	.12	<.04	.05	<.01	.02	.07	.82
July 24/74	.16	.06	<.04	<.01	.01		.07	
Aug. 7/74	.07	.03	<.04	.01	<.01	<.02	.04	
Aug. 14/74	.05	<.03	<.04	<.01	<.01	<.03	.05	
Aug. 21/74	.07	.03	<.04	.02	<.01	<.03	.08	
Sept. 11/74	.05	.02	<.04	.02	<.01	<.02	.05	
Sept. 19/74	.06	.04	<.04	<.01	<.01	<.04	.07	
Sept. 26/74	.03	.04	<.04	.01	<.01	<.05	.07	
Oct. 9/74	.16	.23	<.04	.04	<.01	.11	.32	
Oct. 16/74	.03	.04	<.04	.01	<.01	<.04	.06	
Oct. 30/74	.04	.03	.06	.04	<.01	<.04	.06	
Nov. 13/74	.04	.04	<.04	.02	<.01	<.04	.08	
Dec. 11/74	.03	.05	<.04	.02	<.01	<.04	.07	
Feb. 12/75	<.05	<.05	<.07	<.03	.02	<.04	.08	
Mar. 12/75	<.05	.02	<.02	.05	<.02	<.04	.08	
Apr. 9/75	<.05	<.05	<.07	.03	<.02	<.05	.07	

TABLE 36. (CONT'D)

FINAL EFFLUENT (CONT'D)

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
Apr. 23/75	<.05	<.05	<.07	<.03	<.02	<.05	.05	
May 14/75	.02	<.02	<.02	.02	<.01		.01	
May 28/75	.08	.08	<.02	.04	<.01	<.04	.06	
June 11/75	.06	.06	<.07	<.01	<.02		.05	
June 25/75	.03	.05	.01	<.01	<.01	<.02	.06	
July 8/75	.08	.04	<.02	.02	<.01	.05	.06	
July 23/75	.03	.02	<.02	<.01	<.01	<.05	.06	
Aug. 13/75	.09	.06	<.02	<.01	<.01	<.05	.06	
Aug. 27/75	.02	<.01	.01	<.01	<.01	<.05	.03	
Sept. 17/75	<.03	.03	<.03	<.02	<.01			
Sept. 30/75	.03	<.03	<.02	<.03	<.01	<.03	.06	
Oct. 15/75	.04	.07	<.03	<.02	<.01	<.06	.06	
AVERAGE:	.06	.04	.04	.02	.01	.04	.06	*.82
RANGE: Low	.02	.01	.01	.01	.01	.02	.01	
High	.16	.23	.07	.05	.02	.11	.32	

TABLE 37. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY - GRIMSBY, LAGOON

OPERATED BY: Municipality

ACTUAL POPULATION: 10,000

POPULATION SERVED BY TREATMENT FACILITY: 780

TYPE OF TREATMENT: Primary Sedimentation, Biological Filtration

AVERAGE DAILY FLOW: .08 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
June 26/74	.46	.10	<.04	.06	<.01	.03	.13
June 11/74	.09	.23	<.04	.07	<.01	<.02	.05
July 18/74	.19	.12	<.04	.05	<.01	<.03	.09
July 24/74	.16	.08	<.02	.11	<.01	.11	
Aug. 7/74	.10	.08	<.04	.02	<.01	.02	.13
Aug. 14/74	.24	.14	<.04	.05	<.01	<.02	.10
Aug. 21/74	.17	.08	<.04	.02	<.01	<.03	.09
Sept. 16/74	.25	.48	<.04	.03	<.01	<.02	.07
Sept. 19/74	.10	.33	<.04	.03	<.01	<.04	.06
Sept. 26/74	.11	.14	<.04	.04	<.01	<.05	.11
Oct. 9/74	.15	.16	<.04	.02	<.01	<.04	.06
Oct. 16/74	.12	.14	.04	<.01	<.01	<.04	.06
Oct. 30/74	.22	.20	.06	<.05	.01	.13	<.08
Nov. 27/74	.22	.24	<.04	.03	<.02	<.04	.09
Dec. 11/74	.15	.15	<.04	.05	<.01	<.04	.12
Jan. 30/75	.12	.07	<.07	<.03	<.02	.04	.65
Feb. 12/75	.16	.14	.08	<.03	.03	<.04	.06
Mar. 12/75	.18	.10	<.02	.03	<.02	.05	.08
Mar. 14/75	.18	.08	<.02	.02	<.01	<.04	.09
Apr. 9/75	.24	.13	.10	.04	<.02	.07	.09
May 28/75	.15	.10	<.02	.03	<.01	<.04	.09
June 11/75	.20	.13	<.02	<.01	<.01	<.03	.11
June 25/75	.23	.13	.01	.04	<.01	<.02	.11
July 8/75	.10	.12	.02	.03	<.01	.02	.09
July 23/75	.25	.27	<.02	.04	<.01	.28	.10
Aug. 13/75	.22	.18	<.02	.02	<.01	<.03	.14
Aug. 27/75	.22	.10	.02	.05	<.01	<.05	.18
Sept. 17/75	.38	.08	<.03	<.02	<.01	<.05	.09
Sept. 30/75	.12	.06	.01	<.01	<.01	<.03	.07
Oct. 15/75	.12	.07	<.03	<.02	<.01	<.06	.05
AVERAGE:	.19	.15	.04	.04	.01	.05	.12
RANGE: Low	.09	.06	.01	.01	.01	.02	.05
High	.46	.48	.10	.11	.03	.28	.65

TABLE 37. (CONT'D)

NO. 1 AERATOR CELL

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Mn
Apr. 24/74	.06	.05	<.02	<.01	<.01	.11
AVERAGE	*.06	*.05	*.02	*.01	*.01	*.11
RANGE: Low						
High						

NO. 2 AERATOR CELL

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Mn
Apr. 24/74	.07	.04	<.02	.02	<.01	.10
AVERAGE:	*.07	*.04	*.02	*.02	*.01	*.10
RANGE: Low						
High						

NO. 3 AERATOR CELL

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Mn
Apr. 24/74	.04	.04	<.02	<.02	<.01	.16
AVERAGE:	*.04	*.04	*.02	*.02	*.01	*.16
RANGE: Low						
High						

TABLE 37. (CONT'D)

FINAL EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 11/74				.03			
July 24/74	.03	.03	<.02	<.01	<.01		.09
Aug. 7/74	.03	.50	<.04	.03	<.01	<.02	.07
Aug. 14/74	<.10	<.10	<.04	<.05	<.02	<.02	<.08
Aug. 21/74	.03	.04	.04	.03	<.01	<.03	.16
Sept. 11/74	.04	.05	<.04	.03	<.01	<.02	.13
Sept. 16/74	.04	.05	<.04	.03	<.01	<.02	.13
Sept. 19/74	.03	.07	<.04	.02	<.01	<.04	.11
Oct. 9/74	.06	.10	<.07	<.03	<.02	<.08	.21
Oct. 16/74	.06	.09	.10	<.04	<.03	<.05	.30
Oct. 30/74	.06	.06	.10	<.05	<.02	.13	<.08
Nov. 27/74	.11	.40	<.04	.03	<.02	<.04	.34
Dec. 11/74	.09	.10	<.04	.03	<.01	<.04	.32
Jan. 30/75	.08	.39	<.07	<.03	<.02	.08	.28
Feb. 12/75	.15	.33	<.07	<.03	.03	<.04	.28
Mar. 12/75	.10	.14	<.02	<.03	<.02	<.04	.14
Mar. 14/75	.11	.28	<.02	.02	<.01	<.04	.09
Apr. 9/75	.13	.17	<.07	.03	<.02	<.05	.25
May 28/75	.04	.06	.02	.03	.01	<.04	.21
June 11/75	.02	.03	<.02	<.01	<.01	<.10	.02
June 25/75	.04	.08	.01	<.01	<.01	<.02	.13
July 8/75	.03	.04	<.04	.02	<.01	<.02	.15
July 23/75	.07	.09	<.02	<.01	<.01	<.10	.13
Aug. 13/75	<.03	.03	<.04	<.03	<.01	<.05	.12
Aug. 27/75	.02	.09	.02	<.01	<.01	<.05	.09
Sept. 17/75	.09	.16	<.03	<.02	<.01	<.05	.17
Sept. 30/75	.07	.06	<.01	<.01	<.01	<.03	.16
Oct. 15/75	.12	.07	<.03	<.02	<.01	<.06	.05
AVERAGE:	.07	.13	.04	.03	.01	.05	.16
RANGE: Low	.02	.03	.01	.01	.01	.02	.02
High	.15	.50	.10	.05	.03	.13	.34

TABLE 38. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY - GRIMSBY, BEACH PLANT

OPERATED BY: Municipality

ACTUAL POPULATION: 10,000

POPULATION SERVED BY TREATMENT FACILITY: 220

TYPE OF TREATMENT: Aerated Lagoon

AVERAGE DAILY FLOW: .07 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
June 20/74	.05	<.03	<.04	.04	<.01	<.02	.14
June 26/74	.05	<.03	<.04	.03	<.01	<.03	.14
July 11/74	.11	.04	<.04	.05	<.01	.02	.09
July 18/74	.09	.05	<.04	<.01	<.01	<.03	.09
July 24/74	.14	.06	<.02	.01	<.01		.09
Aug. 7/74	.52	.29	<.04	.11	<.01	<.02	.21
Aug. 14/74	.11	.05	<.04	<.01	<.01	<.03	.06
Aug. 21/74	.15	.05	<.04	.04	<.01	.04	.11
Sept. 14/74	.10	.05	<.04	.02	<.01	<.04	.05
Sept. 11/74	.26	.10	<.04	.09	<.01	.08	.06
Sept. 26/74	.04	.04	<.04	.03	<.01	<.05	.06
Oct. 9/74	.06	.06	<.04	.01	<.01	<.04	.06
Oct. 30/74	.18	.05	.07	<.03	.01	<.04	.07
Nov. 13/74	.14	.07	.04	.02	.01	<.05	.12
Dec. 11/74	.20	.10	<.07	.06	<.02	<.05	.16
Jan. 3/75	.19	<.05	<.07	.07	<.02	<.04	.20
Feb. 12/75	.08	<.05	<.07	<.03	.02	<.04	.13
Mar. 12/75	.05	.09	<.02	.04	<.02	<.04	.22
Apr. 9/75	.17	.08	<.07	.07	<.02	<.05	.28
Apr. 23/75	.08	<.05	<.07	<.03	<.02	<.05	.12
May 14/75	.03	.03	.02	.03	<.01		.15
May 28/75	.10	.05	<.02	.04	<.01	<.04	.09
June 11/75	.04	.02	<.02	<.01	<.01	<.03	.08
June 25/75	.15	.16	.02	.03	<.01	<.02	.18
July 8/75	.16	.05	<.02	.03	<.01	<.02	.08
July 23/75	.12	.05	<.02	.03	<.01	<.10	.11
Aug. 13/75	.10	.07	.02	.03	<.01	<.03	.09
Aug. 27/75	<.02	.04	.02	.02	<.01	<.03	.15
Sept. 17/75	.15	.09	<.03	<.02	<.01	<.05	.09
Sept. 30/75	.08	.04	<.02	<.03	<.01	<.05	.17
Oct. 15/75	.10	.05	<.03	<.02	<.01	<.06	.13
AVERAGE:	.12	.07	.04	.04	.01	.41	.12
RANGE: Low	.02	.02	.02	.01	.01	.02	.05
High	.52	.29	.07	.11	.02	.10	.28

TABLE 38. (CONT'D)

PRIMARY EFFLUENT #1

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
July 8/74	.08	.04	<.04	.08	<.01	<.02	.13	
July 23/74	.13	.05	<.04	.02	<.01	<.03	.10	
Aug. 6/74	.08	.06	<.04	.02	<.01	<.02	.10	
Sept. 3/74	.11	.05	<.04	.04	<.01	<.02	.10	
Sept. 15/74	.05	<.03	<.04	<.01	<.01	<.04	.12	
Oct. 15/74	.10	.05	<.04	.06	<.01	<.04	.13	
Oct. 29/74	.17	.07	.06	<.03	.01	<.04	.08	
Oct. 29/74	.05	.04	<.04	.02	<.01	<.02	.10	.52
Jan. 7/75	.10	<.05	<.07	<.03	<.02	<.04	.09	
Feb. 19/75	.18	<.05	<.02	.08	<.02	<.04	.19	
Feb. 2/75								1.9
Mar. 4/75	.11	.33	<.07	.05	.02	.04	.13	
AVERAGE:	.11	.08	.05	.04	.01	.03	.12	1.2
RANGE: Low	.05	.03	.02	.01	.01	.02	.08	.52
High	.18	.07	.07	.08	.02	.04	.19	1.9

PRIMARY EFFLUENT #2

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
June 12/74	.20	.08	<.04	<.01	<.01	<.04	.13	
July 8/74	.08	.03	<.04	.06	<.01	<.02	.10	
July 23/74	.14	.04	<.04	.02	<.01	<.03	.10	
Aug. 6/74	.10	.05	<.04	.01	<.01	<.02	.10	
Sept. 3/74	.10	.09	<.04	.04	<.01	<.02	.10	
Sept. 15/74	.06	.05	<.04	<.01	<.01	<.04	.09	
Oct. 15/74	.11	.04	<.04	.06	<.01	<.04	.14	
Oct. 29/74	.17	.06	.05	.03	.01	<.04	.09	
Oct. 29/74	.06	.03	<.04	.03	<.01	<.02	.09	.46
Jan. 26/75	.08	.05	<.07	<.03	<.02	.04	.12	
Feb. 19/75	.10	<.05	<.02	.07	<.02	<.04	.15	
AVERAGE:	.11	.05	.04	.03	.01	.03	.11	*.46
RANGE: Low	.06	.03	.02	.01	.01	.02	.09	
High	.20	.09	.07	.07	.02	.04	.15	

TABLE 38. (CONT'D)

FINAL EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 11/74	.09	.05	<.04	.05	<.01	.03	.11
July 18/74	.08	.09	<.04	<.01	.01	<.03	.12
July 24/74	.09	.04	<.02	<.01	<.01	.12	
Aug. 7/74	.06	.04	<.04	<.01	<.01	<.02	.10
Aug. 11/74	.14	.04	<.04	.01	<.01	<.03	.16
Aug. 21/74	.12	.08	<.04	.03	<.01	<.03	.13
Sep. 14/74	.07	.03	<.04	.02	<.01	<.04	.05
Sep. 16/74	.21	.16	<.04	.04	<.01	<.02	.04
Sep. 27/74	.15	.12	<.07	.04	<.02	<.10	.08
Oct. 9/74	.04	.05	<.04	.01	<.01	<.04	.06
Oct. 30/74	.16	.13	.09	<.03	.01	<.04	.06
Nov. 13/74	.14	.08	.04	.03	.01	<.05	.12
Nov. 27/74	.14	.08	<.04	.03	<.02	<.04	.07
Dec. 11/74	.10	.08	<.04	<.03	<.01	<.04	.09
Feb. 12/75	.08	<.05	<.07	<.03	<.02	<.04	.09
Mar. 12/75	.08	.13	<.02	.05	<.02	<.04	.09
Apr. 7/75	.06	<.05	<.07	.03	<.02	<.05	.18
Apr. 23/75	.15	.14	<.07	.04	<.02	<.05	.12
May 14/75	.11	.06	.02	.03	<.01	<.07	.13
May 28/75	.13	.12	.02	.04	<.01	<.04	.19
June 11/75	.05	.04	<.04	<.01	<.01	<.03	.12
June 25/75	.14	.05	.02	.03	<.01	<.02	.18
July 8/75	.17	.10	.02	.02	<.01	<.02	.20
July 23/75	.14	.12	<.02	.02	<.01	<.05	.12
Aug. 13/75	.13	.08	<.02	.02	<.01	<.03	.08
Aug. 27/75	.11	.03	.02	<.01	<.01	<.03	.02
Sep. 17/75	.08	.04	<.03	<.02	<.01	<.05	.09
Sep. 30/75	.07	.03	<.02	<.03	<.01	<.05	.14
Oct. 15/75	.13	.08	<.03	<.02	<.01	<.06	.12
AVERAGE:	.11	.08	.04	.03	.01	.04	.11
RANGE: Low	.04	.03	.02	.01	.01	.02	.02
High	.21	.16	.09	.05	.02	.12	.20

TABLE 39. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY- LINCOLN

OPERATED BY: Municipality

ACTUAL POPULATION: 14,144

POPULATION SERVED BY TREATMENT FACILITY: 3,270

TYPE OF TREATMENT: Primary Sedimentation, Biological Filtration

AVERAGE DAILY FLOW: .30 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
June 20/74	.07	.11	<.04	.04	<.01	.12	.08
June 26/74	.16	.16	<.04	.04	<.01	.03	.09
June 10/74	.13	.18	<.04		<.01	<.04	.07
July 11/74	.19	.24	<.04	.07	<.01	.32	.09
Aug. 7/74	.17	.16	<.04	.02	<.01	<.02	.10
Aug. 14/74	.24	.17	.05	.05	<.01	<.03	.15
Aug. 21/74	.25	.31	<.04	.05	<.01	.07	.13
Sep. 11/74	.20	.32	<.04	.03	<.01	.05	.22
Sep. 19/74	.15	.22	<.04	.02	<.01	<.04	.14
Sep. 26/74	.18	.30	<.04	.04	<.01	<.05	.12
Oct. 9/74	.11	.06	<.04	.04	<.01	<.04	.05
Oct. 16/74	.14	.29	<.04	.03	<.01	<.04	.09
Oct. 30/74	.21	.27	.06	.06	<.01	.08	.04
Nov. 13/74	.15	.21	.04	.03	<.01	.13	.10
Dec. 11/74	.15	.21	<.04	.07	<.01	.04	.12
Jan. 30/75	.10	.11	<.07	<.03	<.02	<.04	.06
Feb. 12/75	.24	3.6	.07	.04	.03	3.8	.10
Mar. 12/75	.10	.20	<.02	.04	<.02	.11	.08
Apr. 9/75	.43	.40	<.07	.08	<.02	<.05	.22
May 10/75	.19	.22	<.02	.07	<.01	<.04	.11
May 28/75	.15	.24	<.02	.04	<.01	<.04	.09
June 11/75	.14	.61	<.02	<.01	<.01	1.0	.09
July 8/75	.11	.14	.02	<.01	<.01	.04	.10
Aug. 8/75	.18	.18	<.02	.02	<.01	<.10	.11
Aug. 13/75	.18	.21	<.02	.02	<.01	<.03	.10
Aug. 27/75	.13	.17	.02	<.01	<.01	<.03	.09
Sep. 17/75	.20	.22	<.03	.06	<.01	.06	.08
Sep. 30/75	.17	.76	<.02	<.03	<.01	<.05	.10
Oct. 15/75	.19	.22	<.01	.04	<.01	.07	.11
AVERAGE:	.17	.36	.03	.04	.01	.23	.10
RANGE: Low	.07	.06	.01	.01	.01	.02	.04
High	.43	3.6	.07	.08	.03	3.8	.22

TABLE 39. (CONT'D)

DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 8/74	50	29	.93		.42	.13	11
July 24/74	.63	83	210	.14	.16		11
AVERAGE:	25	56	106	*.14	.29	*.13	11
RANGE: Low	.63	29	.93		.16	*.13	11
High	50	83	210		.42		11

FINAL EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 10/74	.10	.16	<.04	.03	<.01	.13	.11
July 11/74	.10	.11	<.04	.05	<.01	.10	.09
July 24/74	.13	.16	<.02	.03	.01		.13
Aug. 7/74	.14	.13	<.04	.03	<.01	<.02	<.02
Aug. 14/74	.08	.08	<.04	.04	<.01	.09	.13
Aug. 21/74	.14	.15	<.04	.03	<.01	.22	.13
Sep. 11/74	.14	.25	<.04	.04	<.01	.04	.12
Sep. 19/74	.09	.14	<.04	.02	<.01	.10	.23
Sep. 26/74	.13	.22	<.04	.01	<.01	<.10	.37
Oct. 9/74	.32	.17	.09	.03	<.02	<.08	.12
Oct. 16/74	.11	.18	<.04	.04	<.01	.08	.13
Oct. 30/74	.14	.18	.06	.03	.01	.10	.07
Nov. 13/74	.11	.17	<.04	.06	.01	.13	.12
Dec. 11/74	.09	.17	<.04	.04	<.01	.10	.14
Jan. 30/75	.12	.17	<.07	.03	<.02	<.04	.11
Feb. 12/75	.15	.20	<.07	.03	.03	.13	.13
Mar. 12/75	.10	.20	<.02	.05	<.02	<.04	.12
Apr. 9/75	.07	.08	<.07	.05	<.02	<.05	.13
May 10/75	.08	.09	.02	.03	<.01	<.14	.13
May 28/75	.11	.18	<.02	.04	<.01	<.13	.11
June 11/75	.09	.13	<.02	<.01	<.01	.07	.11
July 8/75	.10	.11	<.02	.06	<.04	.10	.10
July 23/75	.13	.14	<.02	.02	<.01	<.07	.14
Aug. 13/75	.09	.13	<.02	.02	<.01	<.03	.11
Sep. 12/75	.07	.11	.02	<.01	<.01	<.03	.11
Sep. 17/75	.04	.09	<.03	<.02	<.01	.14	.11
Sep. 30/75	.13	.17	<.02	<.03	<.01	.08	.12
Oct. 15/75	.14	.17	<.03	<.02	<.01	.10	.11
AVERAGE:	.12	.15	.04	.03	.01	.09	.13
RANGE: Low	.04	.08	.02	.01	.01	.02	.02
High	.32	.25	.07	.06	.04	.22	.37

TABLE 40. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY - NIAGARA FALLS, CHIPPAWA PLANT

OPERATED BY: Municipality

ACTUAL POPULATION: 5,000

POPULATION SERVED BY TREATMENT FACILITY: 4,800

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .58 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
June 4/74		.08		.01	<.01		<.05
July 4/74	.07	.03	<.04	.03	<.01	.04	.06
Sep. 5/74	.06	.05	<.04	.02	<.01	<.02	.04
Nov. 6/74	<.03	.03	<.04	.02	<.01	<.02	.06
Dec. 4/74	.11	.07	.04	.02	<.01	<.03	.07
Mar. 6/75	.09	.07	<.07	<.03	<.02	<.04	.07
Apr. 3/75	.10	.05	<.07	<.05	<.02	<.05	.07
AVERAGE:	.08	.05	.05	.03	.01	.03	.06
RANGE: Low	.03	.03	.04	.01	.01	.02	.04
High	.11	.08	.07	.05	.02	.05	.07

PLANT EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
June 4/74		<.03		<.03	<.01		
July /74	<.03	<.03	<.04	<.02	<.01	<.03	.03
Sep. 5/74	<.03	<.03	<.04	.02	<.01	<.02	<.02
Nov. 6/74	<.03	<.03	<.04	.02	<.01	<.02	.04
Dec. 4/74	.79	.04	.04	.01	<.01	<.03	.04
Mar. 6/75	<.05	<.05	<.07	<.03	<.02	<.04	.04
Apr. 3/75	.05	<.05	<.07	<.05	<.02	<.05	<.04
AVERAGE:	.16	.04	.05	.03	.01	.03	.04
RANGE: Low	.03	.03	.04	.01	.01	.02	.02
High	.79	.05	.07	.05	.02	.05	.04

TABLE 41. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY - NIAGARA FALLS, NIAGARA/STAMFORD

OPERATED BY: Municipality

ACTUAL POPULATION: 65,790

POPULATION SERVED BY TREATMENT FACILITY: 58,000

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 7.8 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 4/74	.66	.07	.04	.04	<.01	.08	.08
Aug. 6/74	.34	.11	.04	.03	<.01	<.02	.07
Sep. 5/74	.39	.06	.05	.02	<.01	<.02	.06
Oct. 9/74	1.0	.67	.21	.16	<.01	.55	.36
Oct. 9/74	.16	.09	.07	.04	.01	.15	.10
Nov. 7/74	.38	.08	<.04	.20	<.01	.04	.07
Dec. 5/74	.67	.07	<.04	.03	<.01	.05	.07
Jan. 2/75	.21	.09	<.07	<.03	<.02	.25	.07
Feb. 5/75	.31	.06	<.07	.05	<.02	<.04	.07
Mar. 6/75	.25	.07	<.07	.04	<.02	<.04	.10
Apr. 3/75	.24	.05	<.07	<.05	<.02	<.05	.10
May 8/75	.30	.06	<.02	.01	<.01	<.04	.08
June 10/75	.45	.05	.02	.03	<.02	<.03	.08
July 3/75	.45	.13	<.02	.08	<.01	.05	.13
Aug. 8/75	.41	.06	<.02	.02	<.01	<.05	.07
Oct. 1/75	.28	.05	<.05	<.05	<.02	.75	.08
Oct. 3/75	.18	.06	<.03	<.03	<.01	<.04	.07
Oct. 16/75	.33	.09	.03	<.02	<.01	<.06	.07
AVERAGE:	.39	.11	.05	.05	.01	.13	.10
RANGE: Low	.16	.05	.02	.01	.01	.02	.06
High	1.0	.67	.21	.20	.02	.75	.36

DIGESTED SLUDGE - #1 PRIMARY DIGESTER

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr
Sep. 9/74	920	140	15	130	1.8	100
AVERAGE:	*920	*140	*15	*130	*1.8	*100
RANGE: Low						
High						

TABLE 41. (CONT'D)

DIGESTED SLUDGE - #3 SECONDARY DIGESTER

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr
Sep. 9/74	310	59	.49	52	.40	48
AVERAGE:	*310	*59	*.49	*52	*.40	*48
RANGE: Low						
High						

PLANT EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 4/74	.43	<.03	<.04	.03	<.01	.03	.06
Aug. 6/74	.10	.07	.04	.02	<.01	<.02	.05
Sep. 5/74	.50	.06	.05	.03	<.01	<.02	.05
Nov. 7/74	.10	.03	<.04	.17	<.01	<.02	.07
Dec. 5/74	.07	.03	<.04	<.05	<.01	<.04	<.02
Jan. 2/75	.09	<.05	<.07	<.03	<.02	.10	.07
Feb. 5/75	.33	.05	<.07	.06	<.02	<.04	.06
Mar. 6/75	.24	<.05	<.07	<.03	<.02	<.04	.07
Apr. 3/75	.16	<.05	<.07	<.05	<.02	<.05	.10
May 8/75	.11	.02	<.02	<.01	<.01	<.04	.06
June 10/75	.32	.02	.03	.02	<.02	<.03	.08
July 3/75	.14	.06	<.02	.03	<.01	<.04	.08
Aug. 8/75	.17	.04	<.02	.02	<.01	<.05	.04
Oct. 1/75	.10	.05	<.05	<.05	<.02	.20	.07
Oct. 3/75	.12	.04	<.03	<.03	<.01	<.04	.06
Oct. 16/75	.23	.10	<.03	<.02	<.01	<.06	.06
AVERAGE:	.20	.05	.04	.04	.01	.05	.06
RANGE: Low	.07	.02	.02	.01	.01	.02	.02
High	.50	.10	.07	.17	.02	.20	.10

TABLE 42. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY - PORT COLBORNE, EAST PLANT

OPERATED BY: Municipality

ACTUAL POPULATION: 6,000

POPULATION SERVED BY TREATMENT FACILITY: 5,300

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.8 mgd

ANALYTICAL DATA:

DIGESTER SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 9/74	19	20	194	5.1	.14	.48	2.2
Jan. 7/75	.85	.85	7.0	.18	<.10	.20	.20
Apr. 15/75	22	30	180	7.8	1.1	2.3	4.1
July 8/75	36	41	260	11	.42	2.6	5.3
Oct. 7/75	84	77	700	18	.85	6.2	8.3
AVERAGE:	32	34	268	8.4	.52	2.4	4.0
RANGE: Low	.85	.85	7.0	.18	.10	.20	.20
High	84	77	700	18	1.1	6.2	8.3

TABLE 43. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY - PORT COLBORNE, WEST PLANT

OPERATED BY: Municipality

ACTUAL POPULATION: 12,000

POPULATION SERVED BY TREATMENT FACILITY: 9,700

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 7.8 mgd

ANALYTICAL DATA:

DIGESTER SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 9/74	16	13	6.8	6.9	.20	2.4	4.5
Oct. 22/74	2.0	1.4	1.6	.15	.02	.13	.36
Jan. 7/75	19	21	10	7.5	.35	1.9	3.8
Apr. 15/75	23	32	12	10	.50	2.8	8.4
July 8/75	35	32	9.2	9.9	.35	3.2	6.9
Oct. 7/75	51	44	14	15	.50	2.8	7.8
AVERAGE:	24	24	8.9	8.2	.32	2.2	5.3
RANGE: Low	2.0	1.4	1.6	.15	.02	.13	.36
High	51	44	14	15	.50	3.2	8.4

TABLE 44. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY - ST. CATHARINES, PORT WELLER PLANT

OPERATED BY: Municipality

ACTUAL POPULATION: 73,500

POPULATION SERVED BY TREATMENT FACILITY: 71,520

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 7.7 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED		Cr	Zn	Cu	Ni
July 15/74		.20	4.6	.10	.10
Sep. 4/75		.03	55	.06	
Sep. 8/75		1.6	.59	.52	
AVERAGE:		.61	20	.23	*.10
RANGE:	Low	.03	.59	.06	
	High	1.6	55	.52	

TABLE 45. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY - WELLAND

OPERATED BY: Municipality

ACTUAL POPULATION: 44,655

POPULATION SERVED BY TREATMENT FACILITY: 43,410

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 5.5 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
June 12/74	.20	.08	<.04		<.01	<.04	.15	
July 8/74	.15	.05	<.04	.09	<.01	<.02	.14	
July 23/74	.90	.28	.05	.26	<.01	.18	.57	
Aug. 6/74	.16	.07	<.04	.02	<.01	<.02	.10	
Aug. 19/74	1.1	.31	.09	.50	<.01	.25	1.3	
Sep. 3/74	.23	.10	<.04	.16	<.01	.05	.33	
Sep. 15/74	.15	.09	<.04	<.01	<.01	<.04	.20	
Oct. 1/74	.34	.07	.07	.10	<.02	<.07	.16	
Oct. 15/74	.12	.07	<.04	.05	<.01	<.04	.14	
Oct. 29/74	.30	.12	.08	.09	.01	.04	.16	
Nov. 11/74	.07	.05	<.04	.05	<.01	.03	.10	1.0
Jan. 7/75	.12	.06	.08	.03	<.02	<.04	.12	
Feb. 2/75								8.0
Feb. 19/75	.10	.05	.03	.07	<.02	.07	.18	
Mar. 4/75	.19	.09	<.07	.09	<.02	.04	.18	
Mar. 10/75	.37	.06	.08	<.03				
Mar. 10/75	.36	.04	.07	.03				
Mar. 17/75	.19	.11	<.07	.08	<.02	.07	.15	
Mar. 31/75	.10	<.05	<.07	.06	<.02	.09	.13	
Apr. 15/75	.30	.12	<.07	.11	.30	<.05	.17	
May 14/75	.59	.28	.03	.25	<.01	.19	.34	
May 26/75	.33	.17	.06	.24	<.01	.10	.49	
June 8/75	.22	.07	.05	.06	<.01	.07	.24	
June 25/75	.27	.12	.04	.18	<.01	.10	.23	
July 7/75	.22	.10	.04	.07	<.01	.06	.17	
July 22/75	1.4	.54	.14	.29	.01	.45	.94	
Aug. 4/75	.41	.16	.04	.15	<.01	.06	.34	
Aug. 18/75	1.2	.12	.12	<.03	.09	.27		
Aug. 19/75	.48	.16	.11	.10	<.01	.09	.15	
Sep. 18/75	.23	.08	.02	.07	<.01	.07	.21	
Sep. 30/75	.25	.10	.01	<.01	<.01	<.03	.11	
Oct. 6/75	.10	.08	<.02	<.01	<.01	<.03	<.02	
Oct. 14/75	.49	.17	.03	.18	.01	.14	.25	
AVERAGE:	.36	.13	.06	.11	.01	.09	.27	4.5
RANGE: Low	.07	.04	.01	.01	.01	.02	.02	1.0
High	1.4	.54	.14	.50	.30	.45	1.3	8.0

TABLE 45. (CONT'D)

RAW SLUDGE

DATE SAMPLED	Au	Zn	Cu	Cr	Fe	Ni	Hg	Pb	Co	Mn	Ag	Cd
July 8/74	.30	28	14	7.5	560	3.4	.005	13	1.3	15	14	
Oct. 29/74		46	23	7.9		4.0		12		17		.20
Dec. 8/74		1.7	1.0	.45	57	.18		1.7	.04	1.9		<.01
Dec. 18/74		180	16	8.8	920	5.1		20	.65	22		<.20
Dec. 18/74		45	29	17	1300	9.2		26	.87	31		<.50
Jan. 26/75		31	1.7	12	1400	5.2	.006	39	.95	38		.70
Jan. 26/75		26	14	9.7	870	4.7	.036	22	.70	27		.70
Mar. 17/75		26	15	12	780	7.1		16	.60	21		.50
Mar. 17/75		33	17	14	970	7.7		17	.75	25		.40
Apr. 15/75		31	18	.87		6.7		16	.03	20		1.6
Apr. 15/75		36	19	1.1		5.8		20	.04	22		1.0
May 14/75		100	42	29	110	8.7		44	.95	54		.70
May 14/75		110	43	31	110	9.1		13	.95	54		.70
June 8/75		80	30	25	1450	7.9		30		51		.45
June 8/75		90	35	27	1700	2.7	.007	8.9	<.35	9.9		.20
Sep. 26/75		33	13	13	400	2.7	.007	8.9	<.35	9.9		.20
Sep. 26/75		25	17	12	480	2.9	.008	1.8	.30	12		.27
AVERAGE:	*.30	54	21	13	793	5.5	.012	18	.59	25	*14	.52
RANGE: Low		1.7	1.0	.45	57	.18	.005	1.7	.03	1.9		<.01
High		180	43	31	1700	9.2	.036	44	1.3	54		1.6

TABLE 45. (CONT'D)

DIGESTED SLUDGE

DATE SAMPLED	Au	Zn	Cu	Cr	Fe	Ni	Hg	Pb	St	Co	Mn	Ag	Al	Cd	Ca	Mg
July 8/74	1.3	160	53	550	3100	19	.171	120		3.6	95	.42				
July 23/74		129	48	34	4105	18		75		3.6	90		1700	1.3	7800	2200
Oct. 1/74	1.9	140	50	19	4200	18	.018	53	12	2.1	87	2.4				
Oct. 1/74	2.7	100	52	20	4300	18	.062	36	17	2.0	95	2.5				
Oct. 1/74	5.2	120	100	16	1600	90	.173	140	29	5.6	260	42				
Dec. 18/74		20	8.2	3.4	320	1.2		34		.75	9.0			.10		
Dec. 18/74		88	4.1	14	180	5.8		8.3		.25	29			.45		
Jan. 26/75		170	93	54	180	27	.034	140		5.0	140			1.7		
Jan. 26/75		40	17	23	2000	8.8	.042	23		.75	38			.60		
Feb. 19/75		290	130	120	1700	60		110		3.7	230			3.0		
Feb. 19/75		260	120	85	1400	47		130		4.3	180			1.2		
Mar. 17/75		76	33	19	1900	10		32		.90	45			1.0		
Mar. 17/75		63	30	15	1600	8.7		35		.90	39			.80		
Apr. 15/75		390	140	6.6		95		64		.15	280			4.5		
Apr. 15/75		370	150	7.5		100		110		.14	310			5.3		
May 14/75		97	44	25	120	11		43		.75	56			.45		
May 14/75		69	29	30	150	7.6		32		.35	38			.45		
June 8/75		95	32	29	1580	13		37			56			.45		
June 8/75		100	37	30	1800	14		42			59			.50		
Aug. 12/75		13	7.6	1.5		.75		3.3			11			.07		
Aug. 12/75		13	7.6	1.8		.55		.85			9.5			.05		
Sep. 26/75		110	51	45	1800	11	.009	43		1.0	81			.72		
Sep. 26/75		110	48	39	2000	11	.013	52		1.1	81			.85		
AVERAGE:	2.8	131	56	52	1791	26	.065	59	19	1.9	101	12	*1700	1.2	*7800	*2200
RANGE: Low	1.3	13	4.1	1.5	120	.55	.009	.85	12	.14	9.0	.42		.05		
High	5.2	390	150	550	4300	100	.173	140	29	5.6	310	42		5.3		

TABLE 45. (CONT'D)

PLANT EFFLUENT "NORTH"

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
June 12/74	.13	.04	<.04	<.03	<.01	<.04	.06	
July 8/74	.10	.04	.04	.04	<.01	<.02	.13	
July 23/74	.15	.03	<.04	.04	<.01	<.03	.03	
Aug. 6/74	.06	.05	<.04	.02	<.01	<.02	.10	
Aug. 19/74	.12	<.03	<.04	.03	<.01	<.03	.14	
Sep. 3/74	.08	.05	<.04	.03	<.01	<.02	.08	
Sep. 15/74	.04	.05	<.04	<.01	<.01	<.04	.11	
Oct. 1/74	.15	.04	<.04	.04	.01	<.04	.09	
Oct. 15/74	.13	.05	<.04	.07	<.01	<.04	.14	
Oct. 29/74	.15	.11	.06	.05	<.01	<.04	.06	
Nov. 11/74	.25	.06	<.04	.04	<.01	<.02	.09	1.1
Jan. 17/75	.09	.05	<.07	.03	<.02	<.04	.10	
Jan. 26/75	.07	.06	<.07	.05	<.02	.04	.11	
Feb. 2/75								1.9
Sep. 18/75	.03	<.03	<.03	<.02	<.01	<.05	<.04	
AVERAGE:	.11	.05	.05	.04	.01	.03	.09	1.5
RANGE: Low	.03	.03	.03	.01	.01	.02	.03	1.1
High	.25	.11	.07	.07	.02	.05	.14	1.9

PLANT EFFLUENT "SOUTH"

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
July 23/74	.16	.04	<.04	.06	<.01	<.03	.05	
Aug. 6/74	.08	.05	<.04	.02	<.01	<.02	.10	
Aug. 19/74	.11	<.03	<.04	.04	<.01	<.03	.11	
Sep. 3/74	.09	.05	<.04	.02	<.01	<.02	.08	
Oct. 15/74	.12	.05	<.04	.06	<.01	<.04	.11	
Oct. 29/74	.18	.07	.06	.03	.01	<.04	.07	
Nov. 11/74	.05	.05	<.04	.04	<.01	<.02	.09	.57
Jan. 7/75	.09	.05	<.07	.04	<.02	<.04	.10	
Jan. 26/75	.06	.05	<.07	<.03	<.02	.04	.11	
Feb. 19/75	.08	<.05	<.02	.05	<.02	<.04	.14	
Feb. 2/75								1.5
Sep. 18/75	.03	<.03	<.03	<.02	<.01	<.05	<.04	
AVERAGE:	.10	.05	.05	.04	.01	.03	.09	1.0
RANGE: Low	.03	.03	.02	.02	.01	.02	.04	.57
High	.18	.07	.07	.06	.02	.05	.14	1.5

TABLE 46. ANALYTICAL DATA FOR THE NIAGARA REGIONAL MUNICIPALITY - WEST LINCOLN

OPERATED BY: Municipality

ACTUAL POPULATION: 9,126

POPULATION SERVED
BY TREATMENT FACILITY: 1,600

TYPE OF TREATMENT: Contact Stabilization

AVERAGE DAILY FLOW: .18 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Mn	Cr
June 17/74	6.8	3.9	.38	.37	.01	.23	<.04
June 20/74	.43	.45	<.04	.10	.01	.29	<.02
June 25/74	.43	.64	.03	.09	.01	.21	<.02
June 26/74	.12	.35	<.04	.07	<.01	.18	.04
July 11/74	.15	.42	.04	.12	.01	.13	.02
July 24/74	.34	.70	.03	.08	.01	.14	
Aug. 7/74	.30	.91	<.04	.06	<.01	.16	<.02
Aug. 21/74	.18	.65	<.04	.05	<.01	.17	<.03
Sep. 11/74	.19	.62	<.04	.02	<.01	.17	<.04
Sep. 26/74	.18	.14	.17	.15	<.01	.06	.09
Oct. 9/ 74	.23	.39	.04	.10	.01	.23	<.04
Oct. 30/74	.25	.63	.09	.05	.01	.25	.05
Nov. 13/74	.96	1.7	.42	.09	.01	.23	.04
Feb. 12/75	.84	1.3	.16	.41	.04	.40	<.08
Mar. 12/75	.13	.44	<.02	.05	<.02	.11	<.04
Apr. 9/75	.21	.28	.13	.06	.06		<.05
May 14/75	.32	.56	.02	.07	.01	.14	<.04
May 28/75	.12	.44	.03	.05	<.02	.15	<.04
July 8/75	.27	.94	.03	.55	.01	.15	.10
July 23/75	.22	.60	.03	.05	.01	.10	<.10
Aug. 13/75	1.8	.69	.15	<.01	<.01	.15	<.03
Aug. 27/75	.08	.24	.03	<.01	<.01	.11	<.03
Sep. 17/75	.47	.76	<.03	.03	.01	.13	<.05
Sep. 30/75	.27	.80	<.02	.03	<.01	.14	<.05
Oct. 15/75	.27	.26	<.03	<.02	.01	.49	<.06
AVERAGE:	.62	.75	.08	.10	.01	.19	.05
RANGE: Low	.08	.14	.02	.01	.01	.06	.02
High	6.8	3.9	.42	.55	.06	.49	.10

TABLE 46. (CONT'D)

CENTRE SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Mn	Cr	Fe
Oct. 30/74	.61	88	5.9	34	.74	103	21	4500
AVERAGE:	*.61	*88	*5.9	*34	*.74	*103	*21	*4500

NW CORNER SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Mn	Cr	Fe
Oct. 30/74	.59	92	7.0	24	.98	98	19	4800
AVERAGE:	*.59	*92	*7.0	*24	*.98	*98	*19	*4800

FINAL EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Mn	Cr
June 17/74	.11	.11	.03	<.03	.01	.21	<.04
June 20/74	<.03	.07	<.04		<.01	.07	<.02
June 25/74	<.01	.02	.02	<.01	<.01	.06	<.02
June 26/74	<.03	.04	<.04	.03	.01	.09	.03
July 11/74	<.05	.05	.04	.04	<.02	.05	.03
July 24/74	.02	.03	<.02	<.01	<.01	.08	
Aug. 17/74	.05	.05	<.04	.03	<.01	.09	<.02
Aug. 21/74	<.01	.03	<.04	.03	<.01	.11	<.03
Sep. 11/74	<.03	.10	<.04	<.01	<.01	.17	<.04
Sep. 26/74	<.05	.13	<.07	.05	<.02	.13	<.10
Oct. 9/74	<.03	.05	<.04	.02	<.01	.12	<.04
Oct. 30/74	.06	.08	.06	.03	.01	.14	<.04
Nov. 13/74	<.10	<.10	.20	.06	.05	.10	<.23
Feb. 12/75	.09	.13	.08	<.03	.02	.20	<.04
Mar. 12/75	.15	.53	<.02	.05	<.02	.14	<.04
Apr. 9/75	.11	.10	.18	<.03	.07		<.05
May 14/75	<.01	.05	.02	.02	<.01	.05	
May 28/75	.02	.06	.02	<.01	.01	.11	<.04
July 8/75	.02	.02	.02	<.01	<.01	.04	.02
July 23/75	.03	.02	.03	.02	.01	.17	<.10
Aug. 13/75	.01	.01	.02	<.01	<.01	.05	<.03
Aug. 27/75	.06	.03	.02	<.01	<.01	.15	<.03
Sep. 17/75	<.05	<.05	<.06	<.04	<.02	.15	<.12
Sep. 30/75	.03	<.03	<.02	<.03	<.01	.10	<.05
Oct. 15/75	.04	<.03	<.03	<.02	.01	.11	<.06
AVERAGE:	.05	.08	.05	.03	.01	.11	.05
RANGE: Low	.01	.01	.02	.01	.01	.04	.02
High	.15	.53	.20	.06	.07	.21	.23

TABLE 47. ANALYTICAL DATA FOR THE MUNICIPALITY OF NORTH BAY

OPERATED BY: Municipality

ACTUAL POPULATION: 50,000

POPULATION SERVED BY TREATMENT FACILITY: 40,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 6.0 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Cr
Feb. 5/75	<.04
AVERAGE:	*<.04

DIGESTED SLUDGE

DATE SAMPLED		Fe	Cr	Mn	Co	As	Zn	Cu	Ni	Pb	Cd	Al	Mg
Apr. 16/75		300	8.1	6.7	.02	.18	19	42	1.4	14	.02	1852	180
Apr. 16/75		300	9.3	8.1	.03	.32	22	49	1.7	14	.02	1000	180
AVERAGE:		300	8.7	7.4	.02	.25	21	46	1.6	14	.02	1426	180
RANGE:	Low	300	8.1	6.7	.02	.18	19	42	1.4	14	.02	1000	180
	High	300	9.3	8.1	.03	.32	22	49	1.7	14	.02	1852	180

TABLE 48. ANALYTICAL DATA FOR THE MUNICIPALITY OF ORANGEVILLE

OPERATED BY: MOE

ACTUAL POPULATION: 10,000

POPULATION SERVED
BY TREATMENT FACILITY: 10,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.0 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	pH	P	Na	K	Cl^-
1974	17	650	4	29	.90	14	.30	14	440	2100	290	<.40	7.7	930	69	62	94
AVERAGE:	*17	*650	*4	*29	*.90	*14	*.30	*14	*440	*2100	*290	*<.40	*7.7	*930	*69	*62	*94

TABLE 49. ANALYTICAL DATA FOR THE MUNICIPALITY OF ORILLIA

OPERATED BY: Municipality

ACTUAL POPULATION: 24,000

POPULATION SERVED BY TREATMENT FACILITY: 22,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 2.8 mgd

ANALYTICAL DATA:

RAW SEWAGE - CITY

DATE SAMPLED	Al
June 10/74	.58
July 11/74	.48
Aug. 14/74	.47
Sep. 12/74	.80
Oct. 23/74	10
Nov. 7/74	.56
Dec. 3/74	2.4
Jan. 23/75	.87
Feb. 5/75	8.9
Feb. 12/75	2.9
Feb. 20/75	6.1
Mar. 12/75	10
Apr. 7/75	2.5
May 26/75	1.0
June 11/75	6.3
July 15/75	6.7
Aug. 11/75	.57
Sep. 24/75	9.0
Oct. 15/75	2.3
AVERAGE:	3.8
RANGE: Low	.47
High	10

RAW SEWAGE - ONTARIO HOSPITAL

DATE SAMPLED	Al
June 10/74	.07
July 11/74	.30
Aug. 14/74	.22
Sep. 12/74	.45
Oct. 23/74	.25
Nov. 7/74	.34
Dec. 3/74	.36
Jan. 23/75	.22
Feb. 5/75	.31
Feb. 12/75	1.8
Feb. 20/75	.20
Mar. 12/75	.45
Apr. 7/75	.41
May 26/75	1.0
June 11/75	.32
Aug. 11/75	.45
Sep. 24/75	.89
Oct. 15/75	.52
AVERAGE:	.47
RANGE: Low	.07
High	1.8

TABLE 49. (CONT'D)

RAW SEWAGE - COMBINED

DATE SAMPLED	Al
June 10/74	.05
July 11/74	.46
Aug. 14/74	.22
Sep. 12/74	.74
Oct. 23/74	6.9
Nov. 7/74	.62
Dec. 3/74	2.4
Jan. 23/75	1.1
Feb. 5/75	3.6
Feb. 12/75	3.1
Feb. 20/75	7.4
Mar. 12/75	7.3
Apr. 7/75	3.1
May 26/75	1.0
June 11/75	4.9
July 15/75	7.2
Aug. 11/75	.46
Sep. 24/75	9.0
Oct. 15/75	2.1
AVERAGE:	3.3
RANGE: Low	.05
High	9.0

AERATION TANK EFFLUENT

DATE SAMPLED	Al
June 10/74	67
July 11/74	9.8
Aug. 14/74	50
Sep. 12/74	160
Oct. 23/74	110
Nov. 7/74	68
Dec. 3/74	100
Jan. 23/75	.82
Feb. 5/75	220
Feb. 12/75	82
Feb. 20/75	37
Mar. 12/75	22
Apr. 7/75	61
May 26/75	100
June 11/75	110
Aug. 11/75	67
Sep. 24/75	120
Oct. 15/75	68
AVERAGE:	81
RANGE: Low	.82
High	220

PRIMARY CLARIFIER EFFLUENT

DATE SAMPLED	Al
June 10/74	.88
July 11/74	.98
Aug. 14/74	.56
Sep. 12/74	.71
Oct. 23/74	1.7
Nov. 7/74	1.2
Dec. 3/74	1.2
Jan. 23/75	.21
Feb. 5/75	1.2
Feb. 12/75	1.6
Feb. 20/75	1.3
Mar. 12/75	1.1
Apr. 7/75	1.2

FINAL EFFLUENT

DATE SAMPLED	Al
June 10/74	.40
July 11/74	.48
Aug. 14/74	.13
Sep. 12/74	.62
Oct. 23/74	.61
Nov. 7/74	.61
Dec. 3/74	.69
Jan. 23/75	.09
Feb. 5/75	.73
Feb. 12/75	.20
Feb. 20/75	1.2
Mar. 12/75	.69
Apr. 7/75	.35

TABLE 49. (CONT'D)

PRIMARY CLARIFIER EFFLUENT

DATE SAMPLED		Al
May 26/75		1.0
June 11/75		.63
July 15/75		.82
Aug. 11/75		1.2
Sep. 24/75		1.5
Oct. 15/75		1.3
AVERAGE:		1.1
RANGE:	Low	.56
	High	1.7

FINAL EFFLUENT

DATE SAMPLED		Al
May 26/75		.50
June 11/75		.41
July 15/75		.42
Aug. 11/75		1.2
Sep. 24/75		.39
Oct. 15/75		.53
AVERAGE:		.54
RANGE:	Low	.20
	High	1.2

TABLE 50. ANALYTICAL DATA FOR THE MUNICIPALITY OF OWEN SOUND

OPERATED BY: MOE

ACTUAL POPULATION: 18,469

POPULATION SERVED BY TREATMENT FACILITY: 17,750

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 3.8 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	NTA
Oct. 7/75	3.2
AVERAGE	*3.2

RAW SLUDGE

DATE SAMPLED	Al
Oct. 8/74	850
AVERAGE	*850

DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Co	Hg	Cr	P	Al	Ca	Mg	Mo	Ti	pH
1974	39	18	2.4	28	.30	18	830	1.1	<.001	37	920	140	10000	1400	<.20	38	7.3
AVERAGE:	*39	*18	*2.4	*28	*.30	*18	*830	*1.1	*<.001	*37	*920	*140	*10000	*1400	*<.20	*38	*7.3

EFFLUENT

DATE SAMPLED	NTA
Oct. 7/75	2.6
AVERAGE:	*2.6

TABLE 51. ANALYTICAL DATA FOR THE MUNICIPALITY OF PALMERSTON

OPERATED BY: MOE

ACTUAL POPULATION: 1,761

POPULATION SERVED
BY TREATMENT FACILITY: 1,761

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .30 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Ni
Aug. 20/75	<.04
AVERAGE:	*<.04
RANGE: Low	
High	

EFFLUENT

DATE SAMPLED	Ni
Aug. 20/75	<.04
AVERAGE	*<.04
RANGE: Low	
High	

TABLE 52. ANALYTICAL DATA FOR THE MUNICIPALITY OF PARRY SOUND

OPERATED BY: MOE

ACTUAL POPULATION: 5,842

POPULATION SERVED
BY TREATMENT FACILITY: 6,050

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: .906 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Mn	As	Zn	Cu	Ni	Pb	Cd	Al	Co	Cr	Mg	Fe
July 7/75	7.3	.28	35	32	1.2	4.4	.35	2500	<.35	5.0	330	770
July 7/75	7.2	.23	35	33	1.4	17	.35	2600	.40	6.7	330	850
July 22/75	6.1	.10	34	31	1.2	8.5	.25	2500	<.35	5.7	260	660
Aug. 5/75	4.1	.16	23	24	.85	8.0	.20	3200	.35	5.3	120	430
Aug. 5/75	6.8	.21	36	28	1.2	11	.30	3400	.40	5.0	280	750
Aug. 19/75	.12	.16	.57	.56	.04	.20	<.01	1500	<.02	2.3		
AVERAGE:	5.3	.19	27	25	1.0	8.2	.24	2617	.31	5.0	264	692
RANGE: Low	.12	.10	.57	.56	.04	.20	.01	1500	.02	2.3	120	430
High	7.3	.28	36	33	1.4	17	.35	3400	.40	6.7	330	850

TABLE 53. ANALYTICAL DATA FOR THE MUNICIPALITY OF PENETANGUISHENE

OPERATED BY: Municipality

ACTUAL POPULATION: 5,497

POPULATION SERVED
BY TREATMENT FACILITY: 3,500

TYPE OF TREATMENT: Contact Stabilization

AVERAGE DAILY FLOW: .40 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	NTA
Oct. 20/75	.64
AVERAGE	*.64

TABLE 54. ANALYTICAL DATA FOR THE MUNICIPALITY OF PETERBOROUGH

OPERATED BY: Municipality

ACTUAL POPULATION: 57,000

POPULATION SERVED
BY TREATMENT FACILITY: 57,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 9.4 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Cr	Cu	Fe
June 11/74		.19	
June 25/74	.60	.12	
July 9/74	.23	.10	
July 30/74	<.02	.07	
Aug. 13/74	.34	.11	
Sept. 4/74	.25	.09	
Sept. 17/74	.35	.15	
Oct. 1/74	.26	.17	
Oct. 22/74	.12	.15	
Nov. 5/74	.18	.17	
Dec. 3/74	.70	.14	
Dec. 17/74	1.2	.12	
Jan. 7/75	.65	.11	
Jan. 21/75	.30	.14	
Feb. 5/75	.30	.14	
Feb. 25/75	.30	.10	
Mar. 11/75	.14	.11	.93
Mar. 25/75	.14	.07	
Apr. 8/75	.34	.14	
May 6/75	.19	.13	
May 27/75	.07	.11	
Aug. 6/75	<.04	.08	
Aug. 19/75	.21	.12	
Sept. 3/75	.36	.13	
Sept. 16/75	.83	.16	
Sept. 30/75	.18	.37	
Oct. 15/75	1.1	.36	
AVERAGE:	.36	.14	*.93
RANGE: Low	.02	.07	
High	1.2	.37	

TABLE 54. (CONT'D)

DIGESTED SLUDGE

DATE SAMPLED		Zn	Cu	Ni	Pb	Cd	Fe	Cr	Mn
Oct. 1/74		35	24	4.8	18	1.6	790	65	6.0
Sep. 16/75		130	43	2.2	2.6	3.3	1900	84	14
AVERAGE:		83	34	3.5	10	2.5	1345	75	10.0
RANGE:	Low	35	24	2.2	2.6	1.6	790	65	6.0
	High	130	43	4.8	18	3.3	1900	84	14

FINAL EFFLUENT

DATE SAMPLED		Cr	Cu
June 11/74			.04
June 25/74		.05	<.03
July 9/74		.02	.07
July 30/74		<.02	<.03
Aug. 13/74		.03	.05
Sep. 4/74		<.02	<.03
Sep. 17/74		<.04	.03
Oct. 1/74		<.04	.03
Oct. 22/74		<.03	.05
Nov. 5/74		.03	.03
Dec. 3/74		.09	.14
Dec. 17/74		<.07	<.05
Jan. 7/75		.10	<.05
Jan. 21/75		.05	.09
Feb. 5/75		.15	.16
Feb. 25/75		.12	.10
Mar. 11/75		.04	.12
Mar. 25/75		.09	.05
Apr. 8/75		.07	.08
May 6/75		.07	.05
May 27/75		<.04	.09
Aug. 6/75		<.04	.04
Aug. 19/75		<.03	.06
Sep. 3/75		.05	<.03
Sep. 16/75		.06	<.05
Sep. 30/75		<.03	.04
Oct. 15/75		<.03	<.02
AVERAGE:		.05	.06
RANGE:	Low	.02	.02
	High	.15	.16

TABLE 55. ANALYTICAL DATA FOR THE MUNICIPALITY OF POINT EDWARD

OPERATED BY: MOE

ACTUAL POPULATION: 2,773

POPULATION SERVED BY TREATMENT FACILITY: 2,800

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 0.20 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Cl^-
1974	81
AVERAGE:	*81

DIGESTED SLUDGE

DATE SAMPLED	P	Cl^-	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	pH
1974	1300	330	10	330	58	65	2.1	99	.70	33	6000	8100	360	1.4	7.3
AVERAGE:	*1300	*330	*10	*330	*58	*65	*2.1	*99	*.70	*33	*6000	*8100	*360	*1.4	*7.3

EFFLUENT

DATE SAMPLED	Cl^-
1974	116
AVERAGE:	*116

TABLE 56. ANALYTICAL DATA FOR THE MUNICIPALITY OF PORT DOVER

OPERATED BY: MOE

ACTUAL POPULATION: 3,407

POPULATION SERVED BY TREATMENT FACILITY: 2,500

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: .70 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Cl^-
1974	55
AVERAGE	*55

EFFLUENT

DATE SAMPLED	Cl^-
1974	87
AVERAGE	*87

TABLE 57. ANALYTICAL DATA FOR THE MUNICIPALITY OF PORT HOPE

OPERATED BY: MOE

ACTUAL POPULATION: 8,872

POPULATION SERVED
BY TREATMENT FACILITY: 8,600

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.0 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED		Cu
July 3/74		.53
Sep. 6/74		8.1
Sep. 6/74		2.9
AVERAGE:		3.8
RANGE:	Low	.53
	High	8.1

TABLE 58. ANALYTICAL DATA FOR THE MUNICIPALITY OF PRESCOTT

OPERATED BY: MOE

ACTUAL POPULATION: 5,165

POPULATION SERVED BY TREATMENT FACILITY: 5,200

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 1.0 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Cl^-	SO_4	Fe
1974	119	48	19
AVERAGE:	*119	*48	*19

DIGESTED SLUDGE

DATE SAMPLED	P	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	Hg	Ti	pH
1974	82	13	620	130	80	7.0	30	.60	29	730	2800	790	.90	.034	100	6.5
AVERAGE:	*82	*13	*620	*130	*80	*7.0	*30	*.60	*29	*730	*2800	*790	*.90	*.034	*100	*6.5

EFFLUENT

DATE SAMPLED	Cl^-	SO_4	Fe
1974	120	48	12
AVERAGE:	*120	*48	*12

TABLE 59. ANALYTICAL DATA FOR THE MUNICIPALITY OF RICHMOND HILL

OPERATED BY: MOE

ACTUAL POPULATION: 32,384

POPULATION SERVED BY TREATMENT FACILITY: 19,200

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 2.2 mgd

ANALYTICAL DATA:

DIGESTER SUPERNATANT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Mn	Cr
Sep. 11/75	66	74	<.30	9.0	.55	4.3	3.4
Sep. 29/75	56	76	<.20	8.7	.60	4.0	3.2
AVERAGE:	61	75	.25	8.9	.58	4.2	3.3
RANGE: Low	56	74	.20	8.7	.55	4.0	3.2
High	66	76	.30	9.0	.60	4.3	3.4

DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Mn	Cr
Sep. 29/75	67	89	<.20	11	.65	5.3	4.3
AVERAGE:	*67	*89	*<.20	*11	*.65	*5.3	*4.3
RANGE: Low							
High							

TABLE 60. ANALYTICAL DATA FOR THE MUNICIPALITY OF ST. MARY'S

OPERATED BY: MOE

ACTUAL POPULATION: 4,650

POPULATION SERVED BY TREATMENT FACILITY: 4,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .40 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	Hg	Ti	pH	Na	K	Cl^-
1974	10	140	20	20	.40	50	.10	4.7	510	1500	240	<.40	.068	17	7.4	100	90	150
AVERAGE:	* 10	* 140	* 20	* 20	* .40	* 50	* .10	* 4.7	* 510	* 1500	* 240	* <.40	* .068	* 17	* 7.4	* 100	* 90	* 150

TABLE 61. ANALYTICAL DATA FOR THE MUNICIPALITY OF SAULT STE. MARIE

OPERATED BY:	MOE
ACTUAL POPULATION:	80,332
POPULATION SERVED BY TREATMENT FACILITY:	72,000
TYPE OF TREATMENT:	Conventional Activated Sludge
AVERAGE DAILY FLOW:	8.7 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Cl^-	SO_4	Ca
1974	54	50	53
AVERAGE	*54	*50	*53

EFFLUENT

DATE SAMPLED	Cl^-	SO_4	Ca
1974	52	49	56
AVERAGE:	*52	*49	*56

TABLE 62. ANALYTICAL DATA FOR THE MUNICIPALITY OF SHELBURNE

OPERATED BY: MOE

ACTUAL POPULATION: 1,790

POPULATION SERVED BY TREATMENT FACILITY: 1,542

TYPE OF TREATMENT: Lagoon

AVERAGE DAILY FLOW: .20 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Al	pH	P	Cu
June 5/74	150	4.5	6.6	
June 21/74	6.2			
June 26/74	.49			.05
July 3/74	1.2			
July 10/74	.56			
July 14/74	.59			
July 24/74	.90			
July 31/74	.83			
Aug. 7/74	1.1			.35
Aug. 16/74	<.04			
Aug. 21/74	.38			
Aug. 28/74	.11			
Sep. 4/74	.15			
Sep. 11/74	<.08			<.10
Sep. 18/74	.48			
Oct. 2/74	.61			
Oct. 9/74	.39			.08
Oct. 10/74	.38			
Oct. 23/74	.88			
Oct. 29/74	.75			
AVERAGE:	.83	*4.5	*6.6	.15
RANGE: Low	.04			.05
High	150			.35

TABLE 63. ANALYTICAL DATA FOR THE MUNICIPALITY OF SMITHS FALLS

OPERATED BY:	Municipality
ACTUAL POPULATION:	9,585
POPULATION SERVED BY TREATMENT FACILITY:	10,000
TYPE OF TREATMENT:	Primary Sedimentation
AVERAGE DAILY FLOW:	2.0 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Mn	Al
1974	<.04	.89
AVERAGE:	*<.04	*.89

EFFLUENT

DATE SAMPLED	Mn	Al
1974	.04	.06
AVERAGE:	*.04	*.06

TABLE 64. ANALYTICAL DATA FOR THE MUNICIPALITY OF SOUTH PEEL - LAKEVIEW PLANT

OPERATED BY: MOE

ACTUAL POPULATION: 200,000

POPULATION SERVED
BY TREATMENT FACILITY: 200,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 20.8 mgd

ANALYTICAL DATA:

INFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
1974	.52	.25	.19	.23	<.01	.34	.39	16
AVERAGE:	*.52	*.25	*.19	*.23	*<.01	*.34	*.39	*16

DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Hg	P	Al	Mn	Fe	Ca	Mg	Co
Oct. 17/74	46	24	9.1	1.5	1.3	35								
1974	57	20	8.2	60	1.1	34	.010	830	240	28	580	1020	165	1.7
AVERAGE:	52	22	8.7	31	1.2	35	*.010	*830	*240	*28	*580	*1020	*165	*1.7
RANGE: Low	46	20	8.2	1.5	1.1	34								
High	57	24	9.1	60	1.3	35								

EFFLUENT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn	Fe
1974	.10	.04	.13	.03	<.01	.11	.29	.30
AVERAGE:	*.10	*.04	*.13	*.03	*<.01	*.11	*.29	*.30

TABLE 65. ANALYTICAL DATA FOR THE MUNICIPALITY OF STRATFORD

OPERATED BY: MOE

ACTUAL POPULATION: 25,000

POPULATION SERVED
BY TREATMENT FACILITY: 25,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 3.8 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	Hg	Mo	Ti	P	Na	K	Cl^-
1974	31	142	41	37	16	10	1.7	14	400	1800	300	7.0	.045	50	66	500	100	90	150
AVERAGE:	* 31	* 142	* 41	* 37	* 16	* 10	* 1.7	* 14	* 400	* 1800	* 300	* 7.0	* .045	* 50	* 66	* 500	* 100	* 90	* 150

TABLE 66. ANALYTICAL DATA FOR THE MUNICIPALITY OF STURGEON FALLS

OPERATED BY: MOE

ACTUAL POPULATION: 6,200

POPULATION SERVED
BY TREATMENT FACILITY: 6,200

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.0 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Fe	Zn	Cu	Ni	Pb	Cd	As	Co	Cr	Al	Mg	Mn	Sn
June 11/75	1600	23	48	12	3.4	.25	.25	.63	3.4	1000		44	
July 5/75	1500	20	58	15	15	.30	.24	.90	3.7	1100	200	31	
July 22/75	1800	23	50	10	12	.25	.56	.80	5.8	2000	170	29	
July 29/75	1500	22	54	13	12	.30		.95	3.6	1200	220	32	
July 29/75	1200	18	44	11	12	.30		.95	2.8	1100	170	27	
Aug. 12/75	1100	16	36	8.6	11	.25	<.01	.65	2.4	980	170	27	3.0
Oct. 12/75		39	62	15	1.8	.30	.34	.90	4.6	1500	220	42	
Oct. 12/75		22	44	8.4	11	.20	.14	.70	3.6	1300	160	33	
AVERAGE:	1450	23	50	12	10.0	.27	.26	.81	3.7	1273	187	33	*3.0
RANGE: Low	1100	16	36	8.4	1.8	.20	.01	.63	2.4	980	160	27	
High	1800	39	62	15	15	.30	.56	.95	5.8	2000	220	44	

DIGESTER SUPERNATANT

DATE SAMPLED	As
July 22/75	.33
AVERAGE:	*.33

TABLE 67. ANALYTICAL DATA FOR THE SUDBURY REGIONAL MUNICIPALITY

OPERATED BY: MOE

ACTUAL POPULATION: 91,200

POPULATION SERVED BY TREATMENT FACILITY: 12,098

TYPE OF TREATMENT: Extended Aeration

AVERAGE DAILY FLOW: 15.0 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	As	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	Ti	P	Cr	Al	pH	P	Na	K	Cl^-
Jan. 8/75 1974	1.1	21	39	13	8.0	.30	12	322	331	117	.40	150	580	2.0	100	6.6	580	97	98	130
AVERAGE:	* 1.1	* 21	* 39	* 13	* 8.0	* .30	* 12	* 322	* 331	* 117	* .40	* 150	* 580	* 2.0	* 100	* 6.6	* 580	* 97	* 98	* 130

TABLE 68. ANALYTICAL DATA FOR THE MUNICIPALITY OF THUNDER BAY

OPERATED BY: MOE

ACTUAL POPULATION: 110,000

POPULATION SERVED BY TREATMENT FACILITY: 75,000

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 13.5 mgd

ANALYTICAL DATA:

INFLUENT - SOUTH PLANT

DATE SAMPLED	Cl^-
1974	54
AVERAGE:	*54

INFLUENT - NORTH PLANT

DATE SAMPLED	Cl^-
1974	47
AVERAGE:	*47

DIGESTED SLUDGE - SOUTH PLANT

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	Hg	Mo	Ti	pH	P
1974	14	480	37	52	3.0	31	.48	31	900	1900	500	<.60	.015	.80	200	6.8	740
AVERAGE:	*14	*480	*37	*52	*3.0	*31	*.48	*31	*900	*1900	*500	*<.60	*.015	*.80	*200	*6.8	*740

TABLE 68. (CONT'D)

DIGESTED SLUDGE - NORTH PLANT

DATE SAMPLED	P	Na	K	Cl^-	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	Hg	Mo	Ti	pH
1974	290	17	9.0	69	4.0	760	130	150	15	11	.40	18	600	770	230	.80	.140	.30	100	4.8
AVERAGE:	*290	*17	*9.0	*69	*4.0	*760	*130	*150	*15	*11	*.40	*18	*600	*770	*230	*.80	*.140	*.30	*100	*4.8

EFFLUENT - SOUTH PLANT

DATE SAMPLED	Cl^-
1974	57
AVERAGE:	*57

EFFLUENT - NORTH PLANT

DATE SAMPLED	Cl^-
1974	46
AVERAGE:	*46

TABLE 69. ANALYTICAL DATA FOR THE MUNICIPALITY OF TILLSONBURG

OPERATED BY: MOE

ACTUAL POPULATION: 8,486

POPULATION SERVED
BY TREATMENT FACILITY: 6,500

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 0.80 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	pH	P	Na	K	Cl^-
1974	7.4	1800	41	37	16	10	1.7	14	400	1800	300	.70	7.3	2300	47	14	96
AVERAGE:	* 7.4	* 1800	* 41	* 37	* 16	* 10	* 1.7	* 14	* 400	* 1800	* 300	* .70	* 7.3	* 2300	* 47	* 14	* 96

TABLE 70. ANALYTICAL DATA FOR THE MUNICIPALITY OF TIMMINS

OPERATED BY: MOE

ACTUAL POPULATION: 28,542

POPULATION SERVED
BY TREATMENT FACILITY: 40,000

TYPE OF TREATMENT: Primary Sedimentation

AVERAGE DAILY FLOW: 3.5 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Pb	Ca	Mg	Cr	Zn	Cu	Ni	Mn	Fe	Co	Sn	pH	Cd	P
June 4/74	12	1700	460											
Oct. 10/75	13	1800	360	3.3	80	1.9	.14	11	610	.50	.40			
1974	22	1300	440		140	21	1.2	7.0	400	.80		5.8	570	240
AVERAGE:	16	1600	420	*3.3	110	12	.67	9.0	505	.65	*.40	*5.8	*570	*240
RANGE: Low	12	1300	360		80	1.9	.14	7.0	400	.50				
High	22	1800	460		140	21	1.2	11	610	.80				

TABLE 71. ANALYTICAL DATA FOR THE MUNICIPALITY OF WALLACEBURG

OPERATED BY: MOE

ACTUAL POPULATION: 10,550

POPULATION SERVED BY TREATMENT FACILITY: 4,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .30 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	Co	Hg	Mo	Ti	P	Na	K	Cl^-	pH
1974	12	620	52	38	4.5	13	.30	65	610	2100	440	.80	.052	.30	38	1200	58	38	2.7	7.2
AVERAGE:	* 12	* 620	* 52	* 38	* 4.5	* 13	* .30	* 65	* 610	* 2100	* 440	* .80	* .052	* .30	* 38	* 1200	* 58	* 38	* 2.7	* 7.2

TABLE 72. ANALYTICAL DATA FOR THE WATERLOO REGIONAL MUNICIPALITY - CAMBRIDGE (PRESTON)

OPERATED BY: Municipality

ACTUAL POPULATION: 68,000

POPULATION SERVED BY TREATMENT FACILITY: 1,800

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 1.7 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
July 31/74	.18	.11	<.04	.07	.01	<.02	.16
	.20	.08	<.04	.04	.01	<.02	.24
Oct. 8/74	1.6	.09	1.1	.07	.01	.14	.08
Dec. 10/74	.83	.09	<.04	.14	.01	2.9	.06
AVERAGE:	.70	.09	.31	.08	.01	.77	.14
RANGE: Low	.18	.08	.04	.04	.01	.02	.06
High	1.6	.11	1.1	.14	.01	2.9	.24

RAW SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
Dec. 10/74	78	28	<2.3	25	.67	14	8.3
AVERAGE:	*78	*28	*<2.3	*25	*.67	*14	*8.3

TABLE 73. ANALYTICAL DATA FOR THE WATERLOO REGIONAL MUNICIPALITY - ELMIRA

OPERATED BY: MOE

ACTUAL POPULATION: 4,730

POPULATION SERVED
BY TREATMENT FACILITY: 4,820

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: .50 mgd

ANALYTICAL DATA:

RAW SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
Nov. 25/74	31	48	4.0	7.8	.90	32	5.9
Nov. 29/74	24	31	3.0	9.3	1.2	21	4.9
Jan.31/75	74	59	3.3	37	.83	15	15
May 14/75	37	25	1.3	.70	.35	13	4.6
June 17/75	105	52	1.9	10	.70	29	5.3
AVERAGE:	54	43	2.1	13	.80	22	7.1
RANGE: Low	24	25	1.3	.70	.35	13	4.6
High	105	59	4.0	37	1.2	32	15

#1 DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
Nov. 25/74	31	48	4.0	7.8	.90	32	5.9
Nov. 29/74	37	40	3.3	5.3	1.0	23	6.7
Jan. 31/75	52	61	5.2	18	.83	33	11
May 14/75	34	35	1.8	9.7	.95	20	5.1
June 17/75	105	46	1.9	9.9	.55	25	5.5
AVERAGE:	52	46	3.2	10	.85	27	6.8
RANGE: Low	31	35	1.8	5.3	.55	20	5.1
High	105	61	5.2	18	1.0	33	11

TABLE 73. (CONT'D)

#2 DIGESTED SLUDGE

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
Nov. 25/74	51	58	4.5	16	.70	37	10
Nov. 29/74	42	42	3.1	12	.80	24	6.9
Jan. 31/75	58	59	6.8	18	1.5	33	11
May 14/75	24	25	1.5	8.7	.81	77	4.4
June 17/75	120	62	3.0	15	.85	25	9.4
Aug. 8/75	48	30	1.6	7.3	1.1	19	6.0
AVERAGE:	57	46	3.4	13	.96	36	8.0
RANGE: Low	24	25	1.5	7.3	.70	19	4.4
High	120	62	6.8	18	1.5	77	11

DIGESTER SUPERNATANT

DATE SAMPLED	Zn	Cu	Ni	Pb	Cd	Cr	Mn
Nov. 29/74	21	24	3.8	6.6	.70	14	3.9
Jan. 31/75	50	52	5.5	19	1.2	30	9.8
Aug. 8/75	46	27	1.7	7.0	1.0	15	5.0
AVERAGE:	39	34	3.7	10.9	.97	20	6.2
RANGE: Low	21	24	1.7	6.6	.70	14	3.9
High	50	52	5.5	19	1.2	30	9.8

EAST LAGOON FINAL EFFLUENT

DATE SAMPLED	Al	pH	P	Cu
June 5/74	.24	6.9	28	
June 12/74	.48			
June 21/74	.42			
June 26/74	.39			<.05
July 31/74	.16			
Aug. 7/74	.35			<.05
Aug. 16/74	.17			
Aug. 21/74	.17			
Aug. 28/74	.15			
Sep. 4/74	<.04			

TABLE 73. (CONT'D)

EAST LAGOON FINAL EFFLUENT (CONT'D)

DATE SAMPLED	Al	pH	P	Cu
Sep. 11/74	.16			<.05
Sep. 18/74	.15			
Oct. 2/74	.21			
Oct. 9/74	.27			<.05
Oct. 10/74	.14			
Oct. 23/74	.23			
Oct. 29/74	.15			
AVERAGE:	.22	*6.9	*28	<.05
RANGE: Low	.04			<.05
High	.48			<.05

WEST LAGOON FINAL EFFLUENT

DATE SAMPLED	Al	pH	P	Cu
June 5/74	.33	7.9	.16	
June 12/74	.60			
June 21/74	.62			
June 26/74	.37			<.05
July 3/74	.32			
July 10/74	.45			
July 17/74	.68			
July 24/74	.54			
July 31/74	.20			
Aug. 28/74	.09			
Sep. 4/74	<.04			
Sep. 11/74	.80			<.05
Sep. 18/74	.48			
Oct. 2/74	.68			
Oct. 9/74	.87			<.05
Oct. 10/74	.17			
Oct. 23/74	.10			
Oct. 29/74	.14			
AVERAGE:	.41	*7.9	*.16	<.05
RANGE: Low	.04			<.05
High	.87			<.05

TABLE 74. ANALYTICAL DATA FOR THE WATERLOO REGIONAL MUNICIPALITY - KITCHENER

OPERATED BY: MOE

ACTUAL POPULATION: 111,800

POPULATION SERVED BY TREATMENT FACILITY: 111,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 12.0 mgd

ANALYTICAL DATA:

EFFLUENT

DATE SAMPLED	Cu	Ni	Zn	Fe	Pb
Sep. 5/75		.20	.30	2.1	.50
Sep. 9/75	1.8	.10	.40	2.1	
Sep. 11/75	.20	.70	.35	6.8	
Sep. 11/75		.60		1.2	
AVERAGE:	1.0	.40	.35	3.1	*.50
RANGE: Low	.20	.10	.30	1.2	
High	1.8	.70	.40	6.8	

TABLE 75. ANALYTICAL DATA FOR THE WATERLOO REGIONAL MUNICIPALITY - WATERLOO

OPERATED BY: MOE

ACTUAL POPULATION: 44,000

POPULATION SERVED
BY TREATMENT FACILITY: 44,000

TYPE OF TREATMENT: Conventional Activated Sludge

AVERAGE DAILY FLOW: 6.0 mgd

ANALYTICAL DATA:

DIGESTED SLUDGE

DATE SAMPLED	Cr	Al	Zn	Cu	Ni	Pb	Cd	Mn	Fe	Ca	Mg	CO	Hg	Mo	Ti	P	Na	K	Cl^-	pH
1974	27	300	28	41	4.4	10.0	.80	7.0	470	1500	280	.30	<.001	.30	38	640	230	110	270	7.4
AVERAGE:	* 27	* 300	* 28	* 41	* 4.4	* 10.0	* .80	* 7.0	* 470	* 1500	* 280	* .30	* <.001	* .30	* 38	* 640	* 230	* 110	* 270	* 7.4

TABLE 76. ANALYTICAL DATA FOR THE MUNICIPALITY OF WINDSOR - LITTLE RIVER PLANT

OPERATED BY:	Municipality
ACTUAL POPULATION:	203,300
POPULATION SERVED BY TREATMENT FACILITY:	160,000
TYPE OF TREATMENT:	Conventional Activated Sludge
AVERAGE DAILY FLOW:	6.0 mgd

ANALYTICAL DATA:

RAW SEWAGE

DATE SAMPLED	Fe
Aug. 1/74	1.0
AVERAGE:	*1.0

MIXED LIQUOR

DATE SAMPLED	Fe
Aug. 1/74	47
AVERAGE:	*47

RETURN SLUDGE

DATE SAMPLED	Fe
Aug. 1/74	110
AVERAGE:	*110

FINAL EFFLUENT

DATE SAMPLED	Fe
Aug. 1/74	1.0
AVERAGE:	*1.0

TABLE 77. ANALYTICAL DATA - FINAL PROVINCIAL RANGE (mg/l)

	Raw Sewage (Influent		Raw Sludge		Primary Effluent		Aeration Tank		Waste Activated Sludge		Digested Sludge		Digester Supernatant		Final Effluent	
Al	.47	370	.11	850	1.1	2.4	44	82			100	2617	682	705	.20	.89
Zn	.07	2.6	.59	66	.10	5.1	.04	11			1.7	920	.25	178	.03	.56
Cu	.05	3.8	11	92	.05	1.2	.04	7.8			5.3	197	4.7	81	.03	1.0
Ni	.03	1.0	2.1	15	.04	.21	.02	.20			.20	242	.25	3.7	.01	.40
Pb	.02	.49	2.2	74	.03	.93	.01	7.8			.14	130	3.3	45	.02	.50
Cd	.01	.05	.20	.98	.01	.02	.01	.10			.02	570	.10	8.9	.01	.02
Cr	.03	.76	3.0	683	.03	1.7	2.9	6.8			.13	473	3.3	91	.02	.41
Mn	.04	.39	5.2	103	.07	.37	.10	.60			.30	101	.25	6.5	.02	.29
HCN																
NTA	.60	4.5									45	6600			2.6	4.5
Fe	.93	45	206	4800	.46	3.4	24	67	110	310	27	500	868	1117	.30	12
Cl^-	47	126									124	10500			40	120
SO_4	37	85													30	86
Ca	53	72									4.8	77			51	56
H_2S											6.7	21000				
pH																
P			420	440							.001	.140			6.9	7.9
Au											.02	110			.16	.28
Hg													.025	.058		
Co											.40	3.0				
Ag											100	2200				
Sn											3	230				
Mg											2	110				
Na											.19	63				
K											17	200				
As											.20	1.3				
Ti																
Mo																
Sr																

3. BY-LAWS OF ONTARIO COMMUNITIES

3.1 Introduction

A municipal sewer-use by-law represents an attempt to ensure the protection of a municipal sewage treatment plant (including collection and disposal facilities) and to regulate the discharge of industrial wastes to municipal sewers.

As an example, a sewer-use by-law developed by the Ontario Ministry of the Environment and the Municipal Engineers Association for use as a recommended guide in drafting suitable municipal legislation follows.

3.2 A By-law to Control Industrial Waste Discharges to Municipal Sewers

BY-LAW NO.

OF THE CORPORATION OF THE OF

BEING A BY-LAW (set out purpose)

pursuant to (set out statutory authority)

NOW THEREFORE THE COUNCIL of the CORPORATION of the of enacts as follows:

1. In this by-law

(a) "biochemical oxygen demand" means the quantity of oxygen utilized in the biochemical oxidation of matter in five (5) days at twenty (20) degrees celsius;

(b) "colour of a liquid" means the appearance of a liquid from which the suspended solids have been removed;

(c) "combined sewer" means a sewer intended to function simultaneously as a storm sewer and a sanitary sewer;

(d) "matter" includes any solid, liquid or gas;

(e) "Municipality" means the Corporation of the of ;

(f) "pH" means the logarithm to the base 10 of the reciprocal of the concentration of hydrogen ions in grams per litre of solution;

(g) "phenolic compounds" means those derivatives of aromatic hydrocarbons which have a hydroxyl group directly attached to the ring;

(h) "sanitary sewer" means a sewer for the collection and transmission of domestic, commercial and industrial sewage or any of them;

(i) "sewage" means any liquid waste containing animal, vegetable or mineral matter in solution or in suspension, except uncontaminated water;

(j) "sewage works" means any works for the collection, transmission, treatment or disposal of sewage, or any part of any such works;

(k) "Standard Methods" means a procedure set out in "Standard Methods for the Examination of Water and Wastewater" published jointly by American Public Health Association, American Water Works Association and Water Pollution Control Federation, current at the date of testing, or a procedure approved by an analyst of the Ministry of the Environment;

(l) "storm water" means water from rainfall or other natural precipitation or from the melting of snow or ice;

(m) "storm sewer" means a sewer for the collection and transmission of uncontaminated water, storm water, drainage from land or from a watercourse or any of them;

(n) "suspended solids" means solid matter in or on a liquid which matter is removable by filtering;

(o) "uncontaminated water" means water to which no matter has been added as a consequence of its use, or to modify its use, by any person;

2. No person shall discharge or deposit or cause or permit the discharge or deposit into land drainage works, private branch drains or connections to any sanitary sewer or combined sewer, matter of any type or at any temperature or in any quantity which may be or may become harmful to a sewage works, or which may interfere with the proper operation of a sewage works, or which may impair or interfere with any sewage treatment process, or which may be or may become a hazard to persons, animals or property, and without limiting the generality of the foregoing any of the following:

(a) Sewage that may cause an offensive odour to emanate from a sewage works, and without limiting the generality of the foregoing, sewage containing hydrogen sulphide, carbon disulphide, other reduced sulphur compounds, amines or ammonia;

(b) Storm water, water from drainage of roofs or land, or from a watercourse, or uncontaminated water; except that which may be discharged into a combined sewer;

(c) Sewage at a temperature greater than 65 degrees Celsius (149° Fahrenheit);

> Temperature has been cited in degrees Celsius in conformance with international metric units. The Fahrenheit equivalent shown is not exact.

(d) Sewage having a pH less than 6.0 or greater than 10.5 or which due to its nature or content, becomes less than 6.0 or greater than 10.5 within a sewage works;

> The pH limits have been adjusted upwards at each end since it has been found that corrosion of concrete occurs at pH 5.5 and since it has not been demonstrated that problems will be caused at pH 10.5.

(e) Explosive matter, gasoline, benzene, naphtha, fuel oil, solvents or sewage containing any of these in any quantity;

> These substances have been prohibited as they are not normal constituents of sewage and they do represent a potential hazard.

(f) Sewage containing more than milligrams per litre of solvent extractible matter of animal or vegetable origin;

> The limit has been left to the discretion of the municipality.

(g) Sewage containing more than 15 miligrams per litre of solvent extractible matter of mineral or synthetic origin;

(h) Sewage which consists of two or more separate liquid layers;

> This is intended primarily to control discharges of free oil.

(i) Sewage of which the biochemical oxygen demand exceeds milligrams per litre;

> The limit has been left to the discretion of the municipality.

(j) Sewage containing more than milligrams per litre of suspended solids;

> The limit has been left to the discretion of the municipality.

(k) Sewage containing any of the following matter in excess of the indicated concentrations;

This is not intended to be a complete list of materials which may be found in sewage. They are those commonly found in industrial discharges and are therefore specifically regulated. All others are regulated by the general provision of Section 2. Aluminum and iron have been set at 50 mg/l since these metals may be beneficial in the sewage treatment process, but are considered to be harmless at that concentration. Phosphorus has been set a 100 mg/l in recognition that in the near future all sewage treatment plants will be capable of removing this material. Heavy metals have been set at 5 mg/l generally, since this is considered to be the minimum practical level to require industry to meet on a continuous basis.

MATTER	Expressed as	Concentrations in milligrams per litre
Aluminum	Al	50
Arsenic	As	1.0
Barium	Ba	5.0
Cadmium	Cd	2.0
Chloride	Cl^-	1500
Chromium	Cr	5.0
Copper	Cu	5.0
Cyanide	HCN	2.0
Fluoride	F	10
Iron	Fe	50
Lead	Pb	5.0
Mercury	Hg	0.1
Nickel	Ni	5.0
Phenolic compounds		1.0
Phosphorus	P	100
Sulphate	SO_4	1500
Sulphide	S	2.0
Tin	Sn	5.0
Zinc	Zn	5.0

3. No person shall discharge or deposit or cause or permit the discharge or deposit into land drainage works, private branch drains or connections to any storm sewer, matter of any type or at any temperature or in any quantity which may interfere with the proper operation of a storm sewer, or which may obstruct a storm sewer or the flow therein, or which may be or may become a hazard to persons, animals or property, or which may impair the quality of the water in any well, lake, river, pond, spring, stream, reservoir or other water or watercourse and without limiting the generality of the foregoing any of the following:

All of the following, (a) to (k) inclusive, are based on the requirements of the Ministry of the Environment for protection of receiving waters.

(a) Uncontaminated water at a temperature greater than 65 degrees Celsius (149^{o} Fahrenheit);

(b) Sewage at a temperature greater than 65 degrees Celsius (149^{o} Fahrenheit);

(c) Sewage having a pH less than 6.0 or greater than 9.5 or which due to its nature or content becomes less than 6.0 or greater than 9.5 within a sewage works;

(d) Explosive matter, gasoline, benzene, naphtha, fuel oil, solvents or sewage containing any of these in any quantity;

(e) Sewage containing more than 15 milligrams per litre of solvent extractible matter;

(f) Sewage which consists of two or more separate liquid layers;

(g) Sewage containing coloured matter, which sewage would require a dilution in excess of four (4) parts of distilled water to one (1) part of such sewage to produce a mixture the colour of which is not distinguishable from that of distilled water;

(h) Sewage of which the biochemical oxygen demand exceeds 15 milligrams per litre;

(i) Sewage containing any matter which will not pass through a screen having openings not larger than 3.35 millimetres square (No. 6 standard sieve);

(j) Sewage that may cause an offensive odour to emanate from a sewage works, and without limiting the generality of the foregoing, sewage containing hydrogen sulphide, carbon disulphide, other reduced sulphur compounds, amines or ammonia;

(k) Sewage containing any of the following matter in excess of the indicated concentrations;

MATTER	Expressed as	Concentration in milligrams per litre
Aluminum	Al	1.0
Ammonia	N	10
Arsenic	As	1.0
Barium	Ba	0.1
Cadmium	Cd	0.1
Chlorine	Cl_2	1.0
Chromium	Cr	1.0
Copper	Cu	1.0
Cyanide	HCN	0.1
Fluoride	F	2.0
Iron	Fe	1.0
Lead	Pb	1.0
Manganese	Mn	1.0
Mercury*	Hg	0.001
Nickel	Ni	1.0
Phenolic Compounds		0.02
Phosphorus	P	1.0
Suspended Solids		15
Tin	Sn	1.0
Zinc	Zn	1.0

* Federal Government Regulation

4. uxcept as otherwise specifically provided in this by-law, all tests, measurements, analyses and examinations of sewage, its characteristics or contents shall be carried out in accordance with Standard Methods;

> Note that the definition of Standard Methods includes a method approved by an analyst of the Ministry of the Environment.

5.(a) The owner or occupant of commercial or industrial premises with one or more connections to a sewage works shall install and maintain in good repair in each connection a suitable manhole to allow observation, sampling and measurement of the flow of sewage therein, provided that where installation of a manhole is not possible, an alternative device or facility may be substituted with the approval of the Municipality;

(b) Every manhole, device or facility installed as required by Section 5(a) of this by-law shall be designed and constructed in accordance with good engineering practice and the requirements of the municipality, and shall be constructed and maintained on the lands of the owner or occupant of the premises at his expense;

(c) The owner or occupant of commercial or industrial premises shall at all times ensure that every manhole, device or facility installed as required by Section 5(a) of this by-law is at all times accessible for the purposes of observing, sampling and measuring the flow of sewage therein;

> This is considered to be a very important provision and should apply to all connections, existing or proposed. It is important also that it apply to the owner or occupant as this provides a more direct control of the discharge. An amendment to the Municipal Act may be required to allow this provision.

(d) The Municipality may require the owner or occupant of commercial or industrial premises to install devices to monitor sewage discharges and to submit regular reports regarding the discharges to the Municipality.

6. A person who has entered into an agreement with the Municipality with respect to the discharge or deposit of sewage shall not be prosecuted under Section 2 of this by-law for the discharge or deposit of sewage in accordance with the terms of that agreement.

This section replaces the provision known as the special agreements provision, by which it was intended that the municipality could accept wastes not in compliance with the limits set out for discharges into a sanitary sewer. It is considered that to prohibit and then to allow by agreement is unsatisfactory. The wording presented here merely confers immunity from prosecution under Section 2 where an agreement concerning a discharge has been entered into. While the provision of itself is within the power of a municipality to enact, an amendment to the Municipal Act may be required to allow a municipality to enter into agreements respecting sewage.

7.(a) The owner or occupant of commercial or industrial premises may submit to the municipality a program to prevent or to reduce and control the discharge or deposit of sewage or uncontaminated water into connections to a sewage works or to a storm sewer from those premises.

(b) The municipality may issue an approval to be known as a 'program approval' to the person who submitted the program.

(c) A person to whom a program approval has been issued shall not be prosecuted under Section 2 or 3 of this by-law for the discharge or deposit of sewage during the period within which the program approval is applicable provided that the person complies fully with the terms of the program approval.

This section is intended to allow discharge of a non-complying effluent during the period of design, construction and/or installation of treatment facilities.

8. For the purpose of the administration of this by-law, an agent of the Municipality may, upon production of his identification, enter any commercial or industrial premises, to observe, measure and sample the flow of sewage to any sewer.

This provision is considered to be very important. An amendment to the Municipal Act will be required, however, to give legal force to the provision.

9. No person shall break, damage, destroy, deface or tamper with:

(a) Any part of a sewage works:

(b) Any device whether permanently or temporarily installed in a sewage works for the purpose of measuring, sampling and testing of sewage.

10. Every person who contravenes any provision of this by-law is guilty of an offence and on summary conviction is liable to a fine of not more than $ for every day or part thereof upon which such offence occurs or continues.

> The penalty apparently still in force under the Municipal Act is $300. It is considered that the maximum fine should be increased to $1,000 and an amendment to the Municipal Act should therefore be sought. However, certain regional municipalities are empowered to provide for a penalty of up to $1,000 for contravention of a regional by-law and this maximum should be used if authorized.

3.3 Discussion

Sewage treatment facilities are designed, and to some extent operated, on the basis of handling municipal wastes that are of uniform quality and quantity. However, industrial wastes do vary widely in both quality and quantity and, as such, give rise to varying control requirements. Legislation to cover such a dynamic system is difficult to create and to enforce.

Ideally, an effective sewer-use by-law forms the basis of control of all existing and potential industrial wastes that are or could be discharged to a municipal sewerage system. To overcome the factors of variation between municipal sewerage systems, permissible concentrations for industrial waste constituents are suggested in the Ontario model sewer-use by-law. These concentrations are based on known toxicities or potential adverse effects. The same type of controls that are intended to protect sanitary sewers are applied to storm sewers as well. However, storm sewers normally discharge directly to a watercourse and, therefore, control limits at the point of discharge to a storm sewer are in keeping with suggested limits for discharge to an open watercourse. Stringent controls applied to municipal storm sewers also tend to encourage industries to discharge into sanitary sewers.

Section 6 of the model by-law permits special agreements applicable to sanitary sewers as a reasonable alternative to the complete prohibition of certain industrial discharges or the imposition of undue costs of waste treatment on the industry.

In addition, numerous factors have been taken into consideration to ensure general application of the model by-law. However, herein lies a weakness of the by-law; it is both specific and general in nature.

A conflict also arises when a document is to be both legally correct and understood by a "non-legal" or "non-technical" individual. For example, in the first section of the Ontario Ministry of the Environment model by-law, a series of definitions is presented. To remain legally correct, numerous technical terms must be included. These definitions must be thoroughly understood by both municipal officials and industrialists.

Certain substances commonly found in industrial wastes can be toxic to the organisms responsible for secondary treatment and digestion at the sewage treatment plant and to personnel responsible for the operation and maintenance of the sewerage system [1, 2, 3, 4]. Some metals may exhibit these properties. However, the removal of all metals from all waste flows would be technologically impractical and does not make ecological sense. Several of the substances that exhibit toxicity at low concentrations are necessary for the maintenance of populations of desirable organisms at even lower concentrations [5, 6, 7]. It is essential, therefore, that safe limits of these toxic materials be determined and that industries discharging into the sanitary sewers meet these requirements.

3.4 Examples of Typical Ontario Sewer-use By-laws

The complete sewer-use by-laws of three Ontario municipalities of varying population are presented below for general information and to illustrate the varying content within a municipal sewer-use by-law.

3.4.1 Example A (1974 Population - 5,656)

CORPORATION OF THE TOWN OF ( )
BY-LAW NO. 1928

A by-law regulating the discharge of water and wastes into the sewage system and providing penalties for violation thereof: in the Town of ( ) and enacted under the powers conferred under paragraphs 71 and 129 of Subsection 1 of Section 354 of the Municipal Act, R.S.O. 1970,

C284, whereas it is expedient to prohibit and regulate the discharge of domestic sewage and industrial wastes into drains, sewers, sewer systems and sewage works.

The Council of the Corporation of the Town (_____) ENACTS AS FOLLOWS:

1. In this by-law,

   1. "municipality" means the Corporation of the Town of (_____).
   2. "inspector" means a person defined or authorized by the Council of the Town of (_____) to carry out the observations and inspections and to take samples prescribed by the by-law.
   3. "sanitary sewer" means a sewer for the collection and transmission of domestic, commercial and industrial wastes or any of them.
   4. "sanitary sewer connection" means any land drainage, works, pipe or other device that connects directly or indirectly to a sanitary sewer.
   5. "parts per million (ppm)" means parts per million by weight.
   6. "biochemical oxygen demand (BOD)" means the quantity of oxygen utilized in biochemical oxidation of organic matter under standard laboratory procedure in five (5) days at twenty (20) degrees centigrade expressed in parts per million.
   7. "matter" includes any gaseous, liquid or solid substance or any combination thereof.
   8. "phenol compounds" means those hydroxy derivatives of benzene or its condensed nuclei, which can be determined by the 4- Aminoantipyrine Method, or the Gibbs Procedures, in accordance with Standard Methods.
   9. "pH" means the logarithm of the reciprocal of the weight of hydrogen ions in grams per litre of solution.
   10. "suspended solids" means solid matter in or on a liquid, which matter is removable by filtering with a glass fibre filter paper equivalent to a Reeve Angel Glass Fibre Filter Paper No. 934 AH.

11. "colour of a liquid" means the appearance of a liquid, from which the suspended solids have been removed, that results from the kind of light reflected from the liquid.
12. "person" includes a corporation, aggregate or sole.
13. "coliform count" means the number of all coliform bacteria enumerated by standard laboratory procedure and expressed in number of coliform bacteria per 100 millilitres.
14. "interceptor" means a receptacle to prevent oil, grease, sand or other material from passing into piping that discharges directly or indirectly into a sanitary sewer or sanitary sewer connection, land drainage works or private branch drains.
15. "sewage" includes drainage, storm water, commercial wastes, industrial wastes, and wastewater.
16. "sewage works" means, all sewers, sewer systems, sewage pumping stations, sewage treatment plants and other works for the collection acceptance, transmission, treatment and disposal of sewage or for any one or more of them.
17. "standard methods" means, unless the context otherwise requires, the methods and procedures set out in the edition of "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association and current at the time of any examination of any sewage.
18. "storm sewer" means a sewer for the collection and transmission of storm water runoff, drainage or sewage derived from the draining of land or from a watercourse or any one or more of them.
19. "watercourse" means an open channel or ditch constructed as or resulting from the construction of municipal work in which a flow of storm water occurs either continuously or intermittently, including road ditches and including other natural depressions or watercourses draining into any such open channel or ditch whether connected to a storm sewer or not.

2. No connection shall be made to sanitary sewers without the prior written approval of the municipality.

3. No person shall discharge, into land drainage works, private branch drains or connections to any sewer, sewer system or sewage works for the carrying away of domestic sewage or industrial wastes or both, which may be or become harmful to any sewage works or which may interfere with its proper operation, or which may impair or interfere with any sewage treatment process, or which may or may tend to obstruct any sewer, or which may be or may become a hazard to persons, property or animals, and without limiting the generality of the foregoing, any of the following:

(a) Matter having a temperature of more than 150 degrees F.

(b) Matter which may contain any volatile oils of more than one hundred (100) parts per million of fat, oil or grease of animal or vegetable origin; of fifteen (15) parts per million of oil, grease or tar of mineral origin.

(c) Gasoline, benzene, naphtha, fuel oil, acetone, solvents or other inflammable or explosive matter.

(d) Ashes, cinders, garbage, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wool, cellulose, paunch manure or other solids of a type or quantity capable of causing obstruction to the flow in sewers or other interference with the proper operation of the sewage treatment plant.

(e) Matter having a pH lower than 5.5 or higher than 9.5 or where the pH becomes lower than 5.5 or higher than 9.5 during transmission to the Sewage Treatment Plant.

(f) Any liquid matter containing suspended solids exceeding three hundred and fifty (350) parts per million by weight.

(g) Matter that may cause the death or injury to any person or capable of causing damage or hazard to structures, equipment or personnel of the sewage works.

(h) Hydrogen sulphide, carbon disulphide, ammonia, trichloroethylene, sulphur dioxide, formaldehyde, chloride, bromine, pyridine, in such a quantity that an offensive odour could emanate from the sewage works or could cause a nuisance.

(i) Any matter in which the BOD exceeds three hundred (300) parts per million.

(j) Animal wastes such as hair, wool or fur, feathers, intestines or stomach castings, paunch manure, or intestinal contents, hides or parts thereof, hooves, toenails, horns, bones or fleshings in a quantity sufficient to interfere with the proper operation of the sewage works.

(k) Matter containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process or constitute a hazard to humans or animals. Included in this category are waters or wastes containing the following metals or chemicals in excess of the indicated concentrations:

total cadmium,	expressed as Cd	3 ppm
total chlorides,	expressed as Cl 1500	ppm
total chromium,	expressed as Cr	3 ppm
total copper,	expressed as Cu	3 ppm
total cyanides,	expressed as HCN.....	2 ppm
total lead,	expressed as Pb	3 ppm
total nickel,	expressed as Ni	3 ppm
phenolic compounds,	.....	1 ppm
sulphates,	expressed as SO_4.....1500	ppm
total sulphides,	expressed as H_2S.....	2 ppm
total zinc,	expressed as Zn	3 ppm

(l) Any waters or wastes which will in any way damage any sewage works, which will interfere with the efficiency thereof, or which will require any expense or alteration of any sewage works. This includes storm runoff sewage derived from the drainage of lands or roofs or water used for cooling purposes.

(m) Radioactive materials except as may be permitted under the Atomic Energy Control Act RSC 1952, chapter 11, and amendments thereto and regulations thereunder.

4. No owner or person in charge of any private branch drain, land drainage works, or sanitary sewer connections shall discharge or cause or permit to be discharged directly or indirectly any matter into;

(a) any private branch drain, or land drainage works that is capable of discharging any matter into any well, lake, river, pond, spring, stream, reservoir, or other water or watercourse, or on any shore or bank thereof, or into any place from which the matter may be discharged into or deposited in, any well, lake, river, pond, stream, spring, or reservoir, or other water or watercourse,

(b) any connection to a sanitary sewer; unless the owner or the person in charge of the private branch drain, land drainage works or sanitary sewer connection permits upon request, the inspector to enter the lands and premises on or in which the private branch drain, land drainage works or sanitary sewer connection is located and to observe and inspect and to remove any samples of, any matter that is, or is caused or permitted to be discharged, into any branch drain, land drainage works, or sanitary sewer connection.

5. No person shall discharge, cause or permit the discharge or deposit into any land drainage works, drains or place draining to or connecting with any watercourse or storm sewer, any of the following:

(a) sewage at a temperature in excess of one hundred and fifty degrees fahrenheit (150 degrees F.);

(b) sewage containing more than a total of fifteen (15) ppm of fat, oil, grease and other matter which is soluble in ether;

(c) Subject to subparagraph (b) hereof, flammable or explosive matter, and without limiting the generality of the foregoing, gasoline, benzene, naphtha, fuel oil, acetone or other solvents;

(d) any quantity of matter capable of obstructing the flow in or interfering with the proper operation of any part of the sewage works and without limiting the generality of the foregoing, any such quantity of ashes, cinders, garbage, sand, straw, mud, shavings, metal, glass, rags, feathers, plastics, wood, cellulose, tar, animal wastes or other matter that is not dissolved in a liquid at the time of its introduction into the sewage works;

(e) sewage containing any matter in a quantity or concentration that will or may cause the death of or injury of any person, property or animal;

(f) sewage having a pH less than 5.5 or greater than 9.5 or which due to its nature or content becomes less than 5.5 or greater than 9.5 during transmission through the sewage works;

(g) sewage in which suspended solids content exceeds fifteen (15) ppm or sewage containing any suspended solids which are incapable of passing through a screen having openings not larger than one quarter (1/4) of an inch square;

(h) sewage that has or may cause an offensive odour, and without limiting the generality of the foregoing, sewage containing hydrogen sulphide, carbon disulphide, ammonia, trichloroethylene, sulphur dioxide, formaldehyde, chlorine, bromine, pyridine, in such quantity that an offensive odour could emanate from the sewage works or could cause a nuisance;

(i) sewage of which the BOD exceeds fifteen (15) ppm:

(j) sewage containing coloured matter which sewage would require a dilution in excess of four (4) parts of distilled water to one (1) part of such sewage to produce a mixture the colour of which is not distinguishable from that of distilled water when tested in accordance with the Ontario Water Resources Commission Standard Laboratory Sewage Colour Determination Test;

(k) sewage containing toxic or poisonous matter in sufficient quantity to constitute a hazard to persons, property or animals, and, without limiting the generality of the foregoing, sewage containing any of the following matter in excess of the indicated concentrations:

phenolic compounds	0.020 ppm
total cyanides, expressed as HCN	0.1 ppm
total cadmium, expressed as Cd	1.0 ppm
total chromium, expressed as Cr	1.0 ppm
total copper, expressed as Cu	1.0 ppm
total nickel, expressed as Ni	1.0 ppm
total zinc, expressed as Zn	1.0 ppm
total iron, expressed as Fe	17.0 ppm
chlorides, expressed as Cl^-	1500 ppm
sulphates, expressed as SO_4	1500 ppm

(1) sewage in which the coliform count exceeds two thousand four hundred (2400) per one hundred (100) millilitres as determined by Standard Methods.

8. Penalties

Any person convicted of a breach of any of the provisions of this by-law shall forfeit and pay, at the discretion of the Convicting Magistrate, a penalty not exceeding, (exclusive of costs), the sum of $300.00 for each offence. Each day in which any such contravention occurs shall be deemed to be a separate offence. Such penalties shall be recoverable under the provisions of the Summary Convictions Act.

9. Validity

Any section, clause, sentence or provision of this By-law or any part or parts thereof held to be invalid shall be severable and shall not affect the validity of any other part thereof.

READ A FIRST AND SECOND TIME this 24th day of April, 1972.

_____
Mayor

_____
Clerk

READ A THIRD TIME AND FINALLY PASSED this 24th day of July, 1972.

_____
Mayor

_____
Clerk

3.4.2 Example B (1974 population 63,587)

BY-LAW NUMBER 122-75
of
THE CORPORATION OF THE CITY OF (_____)

To repeal By-law No. 150-66 and to regulate the discharge of water and wastes into the Public Sewer Systems providing penalties for violations and providing for imposing surcharges thereof; in the City of (_____),

County of (_____) Province of Ontario and enacted under the powers conferred under Section 354, Subsection 1, Paragraph 129 of The Municipal Act (RSO 1970).

THE COUNCIL OF THE CORPORATION OF THE CITY OF (_____) ENACTS AS FOLLOWS:

1. INTERPRETATIONS

In this by-law

1.1 "biochemical oxygen demand" means the quantity of oxygen utilized in the chemical oxidation of matter in five (5) days at twenty (20) degrees Celsius;

1.2 "chemical oxygen demand" means the quantity of oxygen utilized in the chemical oxidation of matter;

1.3 "City Engineer" means the City Engineer of the City of (_____) or his authorized deputy;

1.4 "colour of a liquid" means the appearance of a liquid, from which the suspended solids have been removed;

1.5 "inspector" means a person defined or authorized by the City Engineer to carry out the observations and inspections and to take samples prescribed by this by-law;

1.6 "land drainage works" means a system of disposal on private property, not connected in any way to the Municipal sewer system, which may consist of a system of tanks, field tiles, or dry wells, but not to include a pretreatment system when approved by the City Engineer;

1.7 "matter" includes any solid, liquid or gas;

1.8 "municipality" means the Corporation of the City of (_____);

1.9 "person" includes a corporation, and the heirs, executors, administrators or other legal representatives of a person in whom the context can apply according to law;

1.10 "pH" means the logarithm to the base ten (10) of the reciprocal of the concentration of hydrogen ions in grams per litre of solution as determined by the "electro-metric or colori-metric methods";

1.11 "phenolic compounds" means those derivatives of aromatic hydrocarbons which have a hydroxyl group directly attached to the ring;

1.12 "sanitary sewer" means a sewer which carries sewage and to which storm and surface water are not intentionally admitted;

1.13 "sewage" means any liquid waste containing animal, vegetable or mineral matter in solution or in suspension except as approved for discharge to the storm sewer by the City Engineer;

1.14 "sewage works" means all facilities for collecting, pumping, treating and disposing of sewage and liquid-borne wastes, or any part of any such works;

1.15 "Standard Methods" means the procedures set out in the current issue of the book titled "Standard Methods for the Examination of Water and Wastewater" published jointly by the American Public Health Association (APHA), The American Water Works Association (AWWA), and the Water Pollution Control Federation (WPCF);

1.16 "storm sewer" means a sewer, the purpose of which as certified by the City Engineer, is to carry storm water and drainage from land or from a watercourse, or other water as approved by the City Engineer;

1.17 "storm water" means water from rainfall or other natural precipitation or from the melting of snow or ice;

1.18 "suspended solids" means solid matter in or on a liquid that is removable by filtering;

1.19 "uncontaminated water" means water to which no matter has been added as a consequence of its use, or to modify its use by any person.

2. USE OF STORM SEWERS

No person shall discharge or cause or permit to be discharged directly or indirectly into:

2.1 Any private branch drain, or land drainage works that is capable of discharging any matter into any well, lake, river, pond, spring, stream, reservoir, or other water or watercourse, or on any shore or bank thereof, or into any place from which the matter may be discharged into or

deposited in any well, lake, river, pond, spring, stream, reservoir, or other water or watercourse;

2.2 Any storm sewer or any connection to a storm sewer; any of the following:

2.2.1 Any matter having a temperature more than sixty-five (65) degrees Celsius;

2.2.2 Any matter which may contain more than fifteen (15) milligrams per litre of fat, oil, grease, or other solvent extractable matter;

2.2.3 Gasoline, benzene, naphtha, fuel oil, or other flammable or explosive matter;

2.2.4 Any matter of a type or quantity capable of causing obstruction to the flow in sewers;

2.2.5 Any matter having a pH lower than six (6) or higher than nine and five-tenths (9.5);

2.2.6 Any matter than in any concentration or quantity will cause the death or injury to any person, fish, animal, bird or fowl, or damage to any property;

2.2.7 Any matter containing suspended solids exceeding fifteen (15) milligrams per litre or which is incapable of passing a screen having openings of three and thirty-five one hundredths (3.35) millimeters square;

2.2.8 Carbon bisulphide, hydrogen sulphide, ammonia, trichloroethylene, and other halogen substituted hydrocarbons, sulphur dioxide, formaldehyde, chlorine, bromine, pyridine, or any other matter that has or may cause an offensive odour;

2.2.9 Any matter of which the biochemical oxygen demand exceeds fifteen (15) milligrams per litre;

2.2.10 Any coloured matter which would require a dilution in excess of four (4) parts of distilled water to one (1) part of such matter to produce a mixture the colour of which is not distinguishable from that of distilled water;

2.2.11 Any matter containing any of the following materials in excess of the following concentrations:

Aluminum as Al	1.0 milligrams per litre
Arsenic as As	1.0 milligrams per litre
Barium as Ba	1.0 milligrams per litre
Cadmium as Cd	0.10 milligrams per litre
Chlorides as Cl^-	1,500 milligrams per litre
Chlorine as Cl_2	1.0 milligrams per litre
Chromium as Cr	1.0 milligrams per litre
Copper as Cu	1.0 milligrams per litre
Cyanides as HCN	0.10 milligrams per litre
Fluoride as F	2.0 milligrams per litre
Iron as Fe	1.0 milligrams per litre
Lead as Pb	1.0 milligrams per litre
Manganese as Mn	1.0 milligrams per litre
Mercury as Hg	0.001 milligrams per litre
Molybdenum as Mo	1.0 milligrams per litre
Nickel as Ni	1.0 milligrams per litre
Phenolic Compounds	0.02 milligrams per litre
Phosphorus as P	1.0 milligrams per litre
Sulphates as SO_4	1,500 milligrams per litre
Tin as Sn	1.0 milligrams per litre
Zinc as Zn	1.0 milligrams per litre

3. USE OF SANITARY SEWERS

No person shall discharge or permit or cause to be discharged directly or indirectly into any sanitary sewer or into any land drainage works, any of the following:

3.1 Matter having a temperature in excess of sixty-five (65) degrees Celsius.

3.2 Matter which may contain any fat, oil or grease of more than one hundred (100) milligrams per litre of animal or vegetable origin, or fifteen (15) milligrams per litre of mineral or synthetic origin.

3.3 Gasoline, benzene, naphtha, fuel oil, acetone, solvents or other flammable or explosive matter.

3.4 Matter of a type or quantity capable of causing obstruction to the flow in sewers or other interference with the proper operation of the sewage works.

3.5 Matter having a pH lower than six (6) or higher than nine and five-tenths (9.5).

3.6 Any liquid matter containing suspended solids exceeding three hundred and fifty (350) milligrams per litre.

3.7 Matter that may cause the death of or injury to any person or capable of causing damage or hazard to structures, equipment and personnel of the sewage works.

3.8 Hydrogen sulphide, carbon bisulphide, ammonia, trichloroethylene and other halogen substituted hydrocarbons, sulphur dioxide, formaldehyde, chlorine, bromine, pyridine, or any other matter that has or may cause an offensive odour or is capable of creating a public nuisance or hazard.

3.9 Any matter of which the biochemical oxygen demand exceeds three hundred (300) milligrams per litre.

3.10 Any matter of which the chemical oxygen demand exceeds one thousand (1,000) milligrams per litre.

3.11 Matter containing a toxic or poisonous or other substance in sufficient quantity to injure or interfere with any sewage treatment process or which constitutes a hazard to humans or animals. Included in this category are waters or wastes containing metals or chemicals such as cyanide, chromium, phenols, copper whose concentrations are more than:

Aluminum as Al	50 milligrams per litre
Arsenic as As	1.0 milligrams per litre
Barium as Ba	5.0 milligrams per litre
Cadmium as Cd	2.0 milligrams per litre
Chlorides as Cl^-	1,500 milligrams per litre
Chromium as Cr	5.0 milligrams per litre
Copper as Cu	5.0 milligrams per litre
Cyanides as HCN	2.0 milligrams per litre

Fluoride as F	10 milligrams per litre
Iron as Fe	50 milligrams per litre
Lead as Pb	5.0 milligrams per litre
Manganese as Mn	5.0 milligrams per litre
Mercury as Hg	0.1 milligrams per litre
Molybdenum as Mo	5.0 milligrams per litre
Nickel as Ni	5.0 milligrams per litre
Phenolic Compounds	1.0 milligrams per litre
Phosphorus as P	100 milligrams per litre
Sulphates as SO_4	1,500 milligrams per litre
Sulphide as S	2.0 milligrams per litre
Tin as Sn	5.0 milligrams per litre
Zinc as Zn	5.0 milligrams per litre
Other metals (each)	5.0 milligrams per litre

3.12 Storm water, water from drainage of roofs or land, or from a watercourse, or uncontaminated water, subject to provisions of the Sewage Service Rate By-law.

4. INSPECTION

The City Engineer and/or Inspector bearing proper credentials and identification, shall be permitted at all times to enter upon any lands or premises served by a city sewer for the purpose of observation, inspection, measurements, sampling and testing to ascertain if the provisions of this by-law are being contravened.

5. ANALYSIS

All analysis shall be performed by "Standard Methods" or by a procedure approved by an analyst of the Ontario Ministry of the Environment or by an analyst of the Corporation of the City of (_____).

6. STANDING ADVISORY COMMITTEE

There shall be a Standing Advisory Committee which shall meet at least once each year to review this by-law and which may recommend changes necessary to keep the by-law abreast of current practices.

The Standing Advisory Committee shall consist of at least eight members of whom at least two shall be from the Municipality's staff, two from the staff of the Ontario Ministry of the Environment, two from industry, and two others. The City Engineer shall select the members of the Committee and may designate a Chairman from among the members of the committee.

7. WASTES OF UNUSUAL STRENGTH OR CHARACTER

If the wastes of any person are of such unusual strength and/or character with respect to suspended solids concentration and/or biochemical oxygen demand concentration or any other matter as approved by the City Engineer that compliance with this by-law is not possible, the City of (_____) may agree to accept the wastes, provided that said wastes are in no way detrimental to the operation of the Water Pollution Control Plant, subject to the person entering into an agreement with the City of (_____), to provide for payment of the sewage service rate surcharge, to be calculated according to the terms of the sewage service rate by-law, or a method determined by the City Engineer, and to be applied to the cost of processing the said wastes. A person who has entered into an agreement with the City of (_____), pursuant to the provisions of this section shall not be prosecuted under the terms of this by-law providing such discharge or deposit of such sewage is in accordance with the terms of the agreement.

8. PROGRAM APPROVAL

When required by the City of (_____), the owner or occupant of commercial or industrial premises must submit to the municipality a program to prevent or to reduce and control the discharge or deposit of sewage or uncontaminated water into connections to a sewage works or to a storm sewer from those premises, whereby the City of (_____) may issue an approval to be known as a 'program approval' to the person who submitted the program.

A person to whom a program approval has been issued shall not be prosecuted under Section 2 or 3 of this by-law for the discharge or deposit of sewage during the period within which the program

approval is applicable provided that the person complies fully with the terms of the program approval.

9. AUTOMATIC SAMPLING

The City of (_____) may install an automatic sampling device, or may require a person to install an automatic sampling device at his own expense, within any part of a person's private storm or sanitary sewer system. No person shall break, damage, destroy, deface or tamper with any part of a sewage works, or any device installed for the purpose of measuring, sampling and testing of sewage or storm water.

10. SAMPLING MANHOLE

In accordance with the Plumbing, Licensing and Regulating By-law, manholes shall be constructed and installed by the Owner or Occupant at his own expense, where directed by the City Engineer, on every building sewer carrying industrial wastes. When, in the opinion of the City of Engineer, a building of another category is of such type that a manhole is required on the building sewer, the owner or occupant shall install such a manhole at his own expense.

The manhole

i) shall be located on the owner's property immediately adjacent to the property line or at some other approved location on the property;

ii) shall be designed, constructed and installed in accordance with the requirements and specifications of the City Engineer;

iii) shall be readily accessible and maintained in a safe condition by the property owner;

iv) shall incorporate a sampling and measuring device at the owner's expense where directed by the City Engineer and to his specifications.

11. VIOLATIONS

The violation of any provision of this by-law shall be and does constitute a separate offence under this by-law for each and every day that such violation shall continue.

12. PENALTIES

Any person found violating at any time any of the provisions of this by-law shall, upon conviction thereof, be subject to a fine of not more than three hundred dollars ($300.00) exclusive of costs, for each such offence and every penalty shall be recovered under the Summary Convictions Act; or the convicting Magistrate or Judge may order that such person carry out the requirements or obligations imposed upon him by virtue of this by-law for the contravention of which the said person has been convicted within a time to be fixed by such order.

13. THAT by-law Number 150-66 of the Corporation of the City of (_____) be and the same is hereby repealed.

14. THAT this by-law shall come into force and effect upon the date of its passing.

READ a first time October 14, 1975

READ a second time October 14, 1975

PASSED

_____ MAYOR

_____ CLERK

3.4.3 Example C (1974 population 236,828)

BY-LAW NO. W.-731-137

A By-law regulating the discharge of Industrial, Commercial, Institutional and Residential Wastes into the Municipal Sewerage System.

WHEREAS it is deemed necessary for the proper and efficient operation of the sewers and the sewage treatment works of the City of (_____) to make regulations concerning the use of such sewers pursuant to paragraphs 69 and 125 of subsection 1 of section 379 of the Municipal Act, Revised Statutes of Ontario 1960, Chapter 249.

BE IT THEREFORE ENACTED by the Municipal Council of the Corporation of the City of (_____) as a by-law thereof as follows:

1. DEFINITIONS

In this by-law:

(a) "BOD" (denoting Biochemical Oxygen Demand) shall mean the quantity of oxygen utilized in biochemical oxidation of organic matter under standard laboratory procedure in 5 days at 20 degrees C, expressed in parts per million by weight and as determined by "Standard Methods".

(b) "Commercial Wastes" shall mean the liquid and liquid-borne wastes from the preparation, cooking and dispensing of food; from the handling, storage and sale of produce; from the washing, cleaning, and dyeing of clothes and materials; from the washing, polishing, painting, and all other wastes as distinct from sanitary sewage, industrial wastes and institutional wastes.

(c) "City Engineer" shall mean the City Engineer of the City of (_____) or his authorized deputy.

(d) "Drain" shall mean the means by which lands and premises served by a sewer are connected to the sewer.

(e) "Industrial Wastes" shall mean the liquid and liquid-borne wastes from any industrial process or from an industrial plant or factory as distinct from sanitary sewage, commercial wastes and institutional wastes.

(f) "Institutional Wastes" shall mean the liquid and liquid-borne wastes from hospitals, nursing homes, reformatories, or prisons as distinct from sanitary sewage, industrial wastes and commercial wastes.

(g) "m.g." shall mean millions of Imperial gallons.

(h) "mgd" shall mean millions of Imperial gallons per day.

(i) "Natural Outlet" shall mean any outlet into a watercourse, pond, ditch, lake or any other body of surface water or ground water.

(j) "Person" includes any individual, firm, partnership, company, association, society, corporation, or group.

(k) "pH" shall mean the logarithm of the reciprocal of the weight of hydrogen ions in grams per litre of solution.

(l) "Phenolic Compounds" means those hydroxy derivatives of benzene, or its condensed nuclei, which can be identified by the 4 Aminoantipyrene method or other procedures in accordance with Standard Methods.

(m) "Properly Shredded Garbage" shall mean the wastes from the preparation, cooking and dispensing of food that has been shredded to such degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particle greater than 1/2 inch in any dimension.

(n) "Sanitary Sewer" shall mean a sewer which carries sewage and to which storm, surface and ground waters shall not be permitted without the approval of the City Engineer.

(o) "Sanitary Sewage" shall mean the liquid and liquid-borne wastes from the sanitary conveniences of dwellings, industries, commercial buildings and institutions.

(p) "Sewage" shall mean any one or any combination of sanitary sewage, industrial wastes, commercial wastes, institutional wastes, liquid-borne wastes, ground waters, surface waters and storm waters.

(q) "Sewage Works" shall mean all sewers, sewer systems, sewage pumping stations, sewage treatment and disposal of sewage and liquid-borne wastes.

(r) "Sewage Treatment Plant" shall mean any arrangement of devices and structures used for treating sewage.

(s) "Sewer" shall mean the public sewer for common use by owners and occupants in carrying away sewage or storm water or both from land and premises served by the sewer.

(t) "Standard Methods" shall mean the methods and procedures set out in the edition of "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association of any sewage.

(u) "Storm Sewer" shall mean a sewer, open channel, ditch or depression the purpose of which, as certified by the City Engineer, is to carry storm and surface water and drainage.

(v) "Watercourse" shall mean an open channel, ditch or depression, either natural or man-made, in which a flow of storm water occurs either continuously or intermittently.

(w) "Suspended Solids" shall mean solids on the surface of, or in suspension in, water, sewage, or other liquids and which are removable by laboratory filtering as determined in accordance with Standard Methods.

(x) "Coliform Count" means the number of all coliform bacteria expressed in number of coliform bacteria per 100 millilitres of solution, as determined in accordance with Standard Methods.

2. USE OF AND CONNECTIONS TO MUNICIPAL SEWERS AND DRAINS:

(a) NO person shall uncover, make any connections with or opening into, use, alter or disturb any municipal sewer, drain, or appurtenance thereof without first obtaining permission, in writing, from the City Engineer.

(b) NO person shall disconnect, except for the purpose of repair, any drain carrying sanitary sewage or other waste to the sewer without first notifying, in writing, the Medical Officer of Health and the City Engineer.

3. USE OF MUNICIPAL SANITARY SEWERS:

(a) Except as hereinafter provided, no person shall discharge or permit to be discharged into any sanitary sewer, or drain, any quantity of matter, including volume and rate of discharge, which may be or become harmful to any sewage works or which may interfere with their proper operation, or which may impair or interfere with any sewage treatment process, or which may or may tend to obstruct any sewer, or which may be or may become a hazard to persons, property or animals, or which will require any expense or alteration to any sewage works, and, without limiting the generality of the foregoing, no person shall discharge or permit to be discharged any of the following:

(i) Any liquid or vapour having a temperature higher than 150° F.

(ii) Any sewage which may contain more than 100 parts per million by weight of fat, oil, or grease of animal or vegetable origin or 15 parts per million by weight of oil, grease and tar of mineral origin.

(iii) Any flammable or explosive matter, and without limiting the generality of the foregoing, gasoline, benzene, naphtha, fuel oil, acetone, or other solvents.

(iv) Any ashes, cinders, sand, earth, mud, straw, metal, glass, rags, pigments, textiles, wood, shredded garbage, wood products, paper fibre, plastics, or other viscous or colloidal substance capable of causing obstruction to the flow in sewers or other interference with the proper operation of the sewage works.

(v) Any animal wastes such as hair, wool or fur, feathers, intestines, stomach casings, paunch manure, or intestinal contents, hides or parts thereof, hooves, toenails, horns, bones, poultry heads, and fleshings in a quantity sufficient to interfere with the proper operation of the sewage works.

(vi) Any sewage having a pH lower than 5.5 or greater than 9.0 or which due to its nature or content, becomes less than 5.5 or greater than 9.0 during transmission to a sewage treatment plant; or having any other property capable of causing damage or hazard to structures, equipment or personnel of the sewage works.

(vii) Any sewage containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process, or constitute a hazard to humans or animals, or create any hazard in the receiving waters of the sewage treatment plant, and without limiting the generality of the foregoing sewage containing any of the following toxic components in excess of the indicated concentrations:

Phenolic Compounds	0.1 ppm
Total Cyanide expressed as HCN	2 ppm
Total Sulphides expressed as H_2S	2 ppm
Total Copper expressed as Cu	3 ppm

Total Chromium expressed as Cr	3 ppm
Total Nickel expressed as Ni	5 ppm
Total Lead expressed as Pb	3 ppm
Total Zinc expressed as Zn	5 ppm
Total Cadmium expressed as Cd	3 ppm
Total Arsenic expressed as As	2 ppm
Total Silver expressed as Ag	2 ppm
Total Iron expressed as Fe	17 ppm
Chlorides expressed as Cl^-	1,500 ppm
Sulphates expressed as SO_4	1,500 ppm
Total Mercury expressed as Hg	0.5 ppm
Other Heavy Metals	5 ppm

(viii) Any sewage that has or may cause an offensive odour, and without limiting the generality of the foregoing, sewage containing carbon disulphide, ammonia, trichloroethylene, sulphur dioxide, formaldehyde, chlorine, bromine, pyridine, in such quantity that an offensive odour could cause a nuisance.

(ix) Any sewage containing coloured matter, which sewage would require a dilution in excess of four (4) parts of local tap water to one (1) part of such sewage to dissipate the colour.

(x) Any sewage which will in any way damage any sewage works, or which will interfere with the efficiency thereof, or which will require any unusual expense or alteration at any sewage works.

(xi) Radioactive materials except as may be permitted under the Atomic Energy Control Act, R.S.C. 1952 Chapter 11 and amendments thereto and regulations thereunder.

(b) NO person shall discharge or permit to be discharged, such quantities of grease, oil or sand into drains or sewers as will interfere with the efficiency of drains, sewers, or sewage works, or that may tend to damage or lower the efficiency of same. When sewage contains such substances every person shall provide and install on their premises at such person's expense, interceptor tanks of such efficiency so that such grease, oil or sand will be

removed. All such interceptor tanks shall be of a design in keeping with good engineering practice and have sufficient capacity for the said purposes, and shall be installed upon the premises in a location readily and easily accessible for cleaning and inspection. Such interceptor tanks shall be maintained by the owner at his expense to the satisfaction of the City Engineer, and shall be in continuous use during times of waste discharge.

(c) NO person shall discharge or permit the discharge into a sanitary sewer, sewer, or drain, of any sewage:

(i) having a 5-day BOD greater than 300 parts per million by weight, or

(ii) containing more than 350 parts per million by weight of suspended solids.

Where the City Engineer shall certify that this section is being contravened such person shall provide, at his expense, such preliminary treatment as may be necessary to:

(i) reduce the BOD to 300 parts per million and the suspended solids to 350 parts per million by weight, or

(ii) reduce objectionable characteristics or constituents to within the maximum limits provided for in this by-law, or

(iii) control the quantities and rates of discharge of such sewage

(d) Where in order to prevent the discharge of an effluent to the Municipal Sewerage System exceeding the strength, nature, quantity or quality permitted by this by-law it is necessary to install preliminary treatment facilities, such facilities shall be constructed or installed at a location and according to design and working methods in keeping with good engineering practice and shall be kept in operation for so long as may be necessary to prevent the dischage of such effluent contrary to the provisions of this by-law. Drawings, specifications and any other pertinent information relating to proposed use of preliminary treatment facilities, including garbage grinders, and grease, oil or sand interceptor tanks shall be submitted to the City Engineer.

(e) Where it is necessary for the purposes of this by-law that a suitable flow measuring and recording device be installed in a drain the owner or occupier of lands and premises served by such drain shall install the same at his own expense, when so required by the City Engineer. Such flow measuring and recording device shall be housed in a suitable structure provided and maintained at the expense of the owner, such structure shall be locked with a padlock provided by the City Engineer, the keys of which will be held in his possession. The City Engineer or persons authorized by him may inspect the premises served at any time.

(f) (i) The owner or occupier of industrial lands and premises served by a drain connecting to the City Sewerage System shall install and maintain, at his own expense, a suitable control manhole in the drain to facilitate observations, sampling and measurements of the wastes as instructed by the City Engineer. Such manhole shall be wholly suitable for such purpose and shall be easily accessible and safely located. The manhole shall be maintained in good repair by such owner or occupier at all times. The City Engineer or persons authorized by him shall have the right to enter and inspect all such premises and the said manhole and all wastes passing therethrough. When required by the City Engineer, a screen or other such apparatus shall be placed in the control manhole at the owner's expense, to protect the sewage works as far as possible, if inadvertently certain conditions of this by-law are not complied with. It will be the responsibility of the owner or occupier of the land to maintain the screen in a clean condition and proper repair at all times.

(ii) The owner or occupier of commercial and institutional lands and premises when required by the City Engineer, shall install a control manhole to meet all requirements of 3 (f) (i) above.

(g) If the discharge of wastes are of such unusual strength or character in respect to biochemical oxygen demand (BOD) and/or suspended solids (SS), that compliance with this by-law is not possible, the Corporation of the City of (_____) may agree to supply special treatment subject to payment therefore as provided in section 7 hereof.

4. STORM SEWER SECTION:

Except as hereinafter provided, no person shall discharge or cause to be discharged any of the following described wastes to any storm sewer:

(i) Any liquid or vapour having a temperature higher than 150° F.

(ii) Any sewage which may contain ashes, cinders, sand, earth, mud, straw, metal, glass, pigments, rags, textiles, tar, wood, wood products, paper fibre, plastics or other viscous or colloidal substance capable of interfering with the proper operation of such sewer.

(iii) Any animal waste such as hair, wool or fur, feathers, intestines or stomach casings, paunch manure, intestinal contents, hides or parts thereof, hooves, toenails, horns, bones, blood and fleshings.

(iv) Any sewage which may contain more than 15 parts per million of oil, fat or grease, or other ether soluble material or lubricating oils.

(v) Any sewage containing suspended solids exceeding 15 ppm by weight or which are capable of passing through a quarter-inch screen.

(vi) Any sewage having a 5-day BOD greater than 15 parts per million by weight.

(vii) Any flammable or explosive matter, and without limiting the generality of the foregoing gasoline, benzene, naphtha, fuel oil, acetone or other solvents.

(viii) Any sewage that has or may cause an offensive odour, and without limiting the generality of the foregoing, sewage containing hydrogen sulphide, carbon disulphide, ammonia,

trichloroethylene, sulphur dioxide, formaldehyde, chlorine, bromine, pyridine, in such quantity that an offensive odour could emanate from the sewage works or could cause a nuisance.

(ix) Any sewage containing coloured matter, which sewage would require a dilution in excess of four (4) parts of local tap water to one (1) part of such sewage to dissipate the colour.

(x) Any sewage having a pH less than 5.5 or greater than 9.0 or having any other property capable of causing damage or hazard to structures, sewers, sewage works and personnel.

(xi) Any sewage containing toxic or poisonous matter in sufficient quantity to injure or constitute a hazard to humans, property, animals, aquatic birds, or water-contained flora and fauna, and without limiting the generality of the foregoing, water or wastes containing any of the following matter in excess of the indicated concentrations:

Phenolic Compounds	0.020 parts per million
Total Cyanide expressed as HCN	0.1 parts per million
Total Cadmium expressed as Cd	1.0 parts per million
Total Chromium expressed as Cr	1.0 parts per million
Total Copper expressed as Cu	1.0 parts per million
Total Nickel expressed as Ni	1.0 parts per million
Total Zinc expressed as Zn	1.0 parts per million
Total Iron expressed as Fe	17.0 parts per million
Chlorides expressed as Cl^-	1,500 parts per million
Sulphates expressed as SO_4	1,500 parts per million
Total Mercury expressed as Hg	0.1 parts per million

(xii) Any sewage in which the coliform count exceeds two thousand four hundred (2400) per one hundred (100) millilitres as determined by Standard Methods.

(xiii) Radioactive materials except as may be permitted under the Atomic Energy Control Act, RSC 1952, Chapter 11, and amendments thereto and regulations thereunder.

5. ANALYSIS OF WATERS AND WASTES:

All tests, analyses and measurements of characteristics of the water and wastes referred to in this by-law shall be determined in accordance with Standard Methods.

6. HYDRAULIC OVERLOADING OF SANITARY SEWERS:

Where it is necessary to reduce the hydraulic overloading of sanitary sewers, the City Engineer may direct that the sewage or a portion of the sewage which does not exceed the limitations described in Section 4 hereof, be discharged to storm sewers or watercourses.

7. SURCHARGES FOR PERSONS OR INDUSTRIES DISCHARGING EXCESS STRENGTH WASTES:

In the event that an agreement is entered into as provided by Clause 3(g) hereof, a sewage treatment charge shall be paid based on the cost of processing sewage having a strength above that outlined in Section 3, sub-clause (c) of this By-law.
In calculating the treatment charge to be paid for strengths of BOD and suspended solids above that allowed in Section 3, sub-clause (c) of this By-law, the following rules and formulae shall be used:

(i) Determination of the cost per pound for the treatment of BOD and Suspended Solids

$$x = \frac{c}{2 \times b \times q \times 10}$$

$$y = \frac{c}{2 \times s \times q \times 10}$$

Where x = cost per pound to treat BOD in dollars.
Where y = cost per pound to treat suspended solids in dollars.
Where c = average of operating costs of sewage treatment plants for previous (3) years.
Where b = weighted average BOD in ppm of influent flows to sewage treatment plants for previous year, less 15 ppm.

Where s = weighted average suspended solids in ppm of influent flows to sewage treatment plants for previous year, less 15 ppm.

Where q = total flow to sewage treatment plants for previous year in m.g.

(ii) Determination of waste flow will be made as follows:

(a) By actual quantities of effluent discharged as determined by recording meters installed and maintained by the owner as provided for in Section 3 of this By-law, or,

(b) $w = j + k - m$

Where w = waste flow in gallons per annum to be used in calculating levy.

Where j = water in gallons per annum purchased from the Public Utilities Commission.

Where k = water in gallons per annum obtained from other sources such as private well systems.

Where m = clear unpolluted water in gallons per annum passing restrictions given in Section 4 of this By-law, and discharged to storm sewers or to watercourses.

(iii) Determination of Waste Strength

Determination of the BOD and suspended solids shall be determined in the City of (_____) laboratories from composite samples taken at intervals by personnel of the City Engineer's Department. These samples will be taken not less than twice (2) a year.

(iv) Determination of Quantities of BOD and Suspended Solids to be used in making surcharges:

$$V_b = \frac{i_b \times w \times 10}{10^6}$$

$$V_s = \frac{i_s \times w \times 10}{10^6}$$

Where V_b = excess pounds of BOD discharged to sanitary sewers annually, by the person or industry to be levied.

Where V_s = excess pounds of suspended solids discharged to sanitary sewers annually, by the person or industry to be levied.

Where i_b = 5-day BOD in ppm determined from composite samples for persons or industry collected under subclause (iii) of Section 7, minus 300 ppm as allowed under Section 3 sub-clause (c) of this by-law.

Where i_s = suspended solids in ppm determined from composite samples for persons or industry, collected under sub-clause (iii) of Section 7, minus 350 ppm as allowed under Section 3 sub-clause (c) of this by-law.

Where w = waste flow as determined under sub-clause (ii) of Section 7.

(v) Calculation of Surcharges:

Annual Charge = x (V_b) + y (V_s) in dollars.

(vi) Billing of Surcharges:

The affected persons shall be billed annually. In the event that the latest metered water reading, BOD or suspended solids loadings for the year to be billed, are not immediately available, the surcharges will be estimated using the previous available readings as a guide. All adjustments will be made in subsequent billings when the data is available.

8. POWERS AND AUTHORITY OF THE CITY ENGINEER:

(a) The City Engineer and employees of the City bearing proper credentials and identification shall be permitted at all reasonable times to enter upon any lands or premises served by a City sewer for the purpose of observation, inspection, measurements, sampling and testing to ascertain if the provisions of this by-law are being complied with.

(b) The City Engineer of the Corporation of the City of (_____) shall be responsible for the administration and enforcement of this By-law.

9. PENALTIES:

Any person convicted of a breach of any of the provisions of this By-law shall forfeit and pay at the discretion of the convicting Magistrate, a penalty not exceeding (exclusive of costs) the sum of $300.00 for each offence. Each day in which such contravention occurs shall be deemed to be a separate offence. Such penalties shall be recoverable under the provisions of the Summary Convictions Act as provided by the Municipal Act.

10. VALIDITY

Any section, clause, sentence or provision of this By-law or any part or parts thereof held to be invalid shall be severable and shall not affect the validity of any other part thereof.

11. That By-law No. W-275-635, passed on the fourth day of December, 1961, entitled "A By-law regulating the discharge of Industrial, Commercial, Institutional and Residential Wastes to the Public Sewers", be, and the same is, hereby repealed.

12. That this By-law shall come into force and take effect on the day of the final passing thereof.

PASSED in open Council this fifteenth day of March, A.D., 1971.

_____ _____

Mayor Deputy City Clerk

3.5 Summary of Ontario Municipal Sewer-Use By-laws

To determine the status of the municipal sewer-use by-law in Ontario, 57 municipalities were selected on the basis of provincial ownership of a sewage treatment plant and the enactment of a sewer-use by-law. The sewer-use by-laws of Guelph, London and Kingston also have been included because of the availability of the data, although the sewage treatment plants of these three municipalities are not provincially owned or operated. It should be stressed that every attempt has

been made to ensure the accuracy of the summary data presented in this subsection. However, significant changes may have occurred with respect to individual by-laws since the time of data collection. In any case, the data does provide a basic means of comparison of the by-laws that have been routinely adopted by Ontario communities and allows us to make relevant observations.

It should be noted that many of the communities discussed in this section are also discussed in Sections 2 and 6.

3.5.1 Index

(1) Alliston
(2) Belleville
(3) Bradford
(4) Brantford
(5) Burlington
(6) Campbellford
(7) Carleton Place
(8) Cayuga
(9) Chatham
(10) Cornwall
(11) Deseronto
(12) Eganville
(13) Elmira
(14) Fergus
(15) Galt (Cambridge)
(16) Georgetown
(17) Grand Valley
(18) Guelph
(19) Haileybury
(20) Hespeler (Cambridge)
(21) Huntsville
(22) Twp. of Ignace
(23) Ingersoll
(24) Kingston
(25) Kirkland Lake
(26) Kitchener
(27) London
(28) Twp. of Longlac
(29) Markham
(30) Meaford
(31) Midland
(32) Twp. of Moore
(33) Newmarket
(34) North Bay
(35) Orangeville
(36) Paris
(37) Pickering
(38) Point Edward
(39) Port Dover
(40) Port McNicoll
(41) Prescott
(42) Preston (Cambridge)
(43) Red Lake
(44) Richmond Hill
(45) St. Mary's
(46) Sault Ste. Marie
(47) Southampton
(48) South Peel
(49) Stratford
(50) Sturgeon Falls
(51) Sudbury
(52) Thunder Bay
(53) Tillsonburg
(54) Timmins
(55) Twp. of Tisdale
(56) Trenton
(57) Waterloo

3.5.2 Summary

(1) TOWN OF ALLISTON

BY-LAW PASSED - March 15, 1971

1974 POPULATION - 3,588

TOWN OF ALLISTON (Cont'd)

Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl^-	1500	" "
Total sulphates " " SO_4	1500	" "
Oil, Fat, Grease of animal and vegetable origin	100	" "
Oil, Grease, Tar of mineral origin	15	" "

(2) CITY OF BELLEVILLE

BY-LAW PASSED - December 5, 1967

1974 POPULATION - 35,125

Oil, Fat, Grease of animal and vegetable origin	150	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.5	" "
Total cyanides, expressed as HCN	3.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	5.0	" "
Total chromium " " Cr	5.0	" "
Total nickel " " Ni	5.0	" "

CITY OF BELLEVILLE (Cont'd)

Total lead expressed as Pb	5.0	milligrams/litre
Total zinc " " Zn	8.0	" "
Total cadmium " " Cd	5.0	" "

(3) TOWN OF BRADFORD

BY-LAW PASSED - March 31, 1970

1974 POPULATION - 4,170

Oil, fat, grease of vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides, expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	5.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	5.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(4) CITY OF BRANTFORD

BY-LAW PASSED - October 14, 1975

1974 POPULATION - 63,587

Temperature	65	^{o}C
Oil, fat, grease of animal and vegetable origin	100	milligrams/litre
Oil, fat, grease of mineral synthetic origin	15	" "
pH	6.0 - 9.5	

CITY OF BRANTFORD (Cont'd)

Suspended solids	350	milligrams/litre
BOD	300	" "
Total chromium, expressed as Cr	5.0	" "
Total cyanide " " HCN	2.0	" "
Phenolic compounds	1.0	" "
Total copper, expressed as Cu	5.0	" "
Total cadmium " " Cd	2.0	" "
Total nickel " " Ni	5.0	" "
Total zinc " " Zn	5.0	" "
Total aluminum " " Al	5.0	" "
Total arsenic " " As	1.0	" "
Total barium " " Ba	5.0	" "
Total chlorides " " Cl	1500	" "
Total fluoride " " F	10	" "
Total iron " " Fe	10	" "
Total lead " " Pb	3.0	" "
Total mercury " " Hg	0.10	" "
Total phosphorus " " P	100	" "
Total sulphate " " SO_4	1500	" "
Total sulphide " " S	2.0	" "
Total tin " " Sn	5.0	" "
Total molybdenum " " Mo	5.0	" "
Other metals	5.0	" "
COD	1000	" "

(5) CITY OF BURLINGTON
(Regional Municipality of Halton)

BY-LAW PASSED - proposed

1974 POPULATION - 97,972

Temperature	65	^{o}C
pH of sewage within sewage works	6.0 - 10.5 6.0 - 9.5	
Solvent extractible matter of animal or vegetable origin	100	milligrams/litre

CITY OF BURLINGTON (Cont'd)

Solvent extractible matter of mineral or synthetic origin	15	milligrams/litre
BOD	300	" "
Suspended solids	350	" "
Total aluminum expressed as Al	50	" "
Total arsenic " " As	1.0	" "
Total barium " " Ba	5.0	" "
Total cadmium " " Cd	2.0	" "
Total chloride " " Cl	1500	" "
Total chromium " " Cr	3.0	" "
Total copper " " Cu	3.0	" "
Total cyanide " " HCN	2.0	" "
Total fluoride " " F	10	" "
Total iron " " Fe	50	" "
Total lead " " Pb	3.0	" "
Total mercury " " Hg	0.1	" "
Total nickel " " Ni	3.0	" "
Phenolic compounds	1.0	" "
Total phosphorus " " P	100	" "
Total sulphate " " SO_4	1500	" "
Total sulphide " " S	2.0	" "
Total tin " " Sn	5.0	" "
Total zinc " " Zn	3.0	" "

(6) TOWN OF CAMPBELLFORD

BY-LAW PASSED - August 30, 1971

1974 POPULATION - 3,471

Oil, Fat, grease of animal vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	$^{o}_{F}$
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "

TOWN OF CAMPBELLFORD (Cont'd)

Total cyanides, expressed as HCN	2.0	milligrams/litre
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(7) TOWN OF CARLETON PLACE

BY-LAW PASSED - April 12, 1971

1974 POPULATION - 5,025

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.02	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(8) TOWN OF CAYUGA

BY-LAW PASSED - May 17, 1971

1974 POPULATION - 15,645

Temperature	150	^{o}F
Fat, oil, grease of mineral origin	10	milligrams/litre
Fat, oil, grease of animal, vegetable origin	100	" "
pH	6.0 - 9.0	
Phenolic compounds	100	milligrams/litre
Total chlorides expressed as Cl	1500	" "
Total sulphates " " SO_4	1500	" "
BOD	300	" "
Suspended solids	350	" "

(9) CITY OF CHATHAM

BY-LAW PASSED - October 5, 1970

1974 POPULATION - 36,610

Temperature	150	^{o}F
Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	1.0	" "
Total cyanides expressed as HCN	3.0	" "
Total sulphides " " H_2S	5.0	" "
Total copper " " Cu	5.0	" "
Total zinc " " Zn	5.0	" "
Total chromium " " Cr	5.0	" "
Total nickel " " Ni	5.0	" "
Total lead " " Pb	5.0	" "
Total cadmium " " Cd	5.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(10) CITY OF CORNWALL

BY-LAW PASSED - July 31, 1967

1974 POPULATION - 4,592

Temperature	150	$^{o}_{F}$
Fat, oil, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease of mineral origin	15	" "
pH	5.5 - 9.5	
Suspended solids	350	milligrams/litre
BOD	300	" "
Total chromium expressed as Cr	3.0	" "
Total cyanide " " HCN	2.0	" "
Phenolic compounds	0.1	" "
Total copper expressed as Cu	1.0	" "
All heavy metals other than iron in excess of	5.0	" "

(11) TOWN OF DESERONTO

BY-LAW PASSED - March 15, 1971

1974 POPULATION - 1,833

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	$^{o}_{F}$
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "

TOWN OF DESERONTO (Cont'd)

Total zinc expressed as Zn	3.0	milligrams/litre
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(12) VILLAGE OF EGANVILLE

BY-LAW PASSED - April 5, 1971

1974 POPULATION - 1,377

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(13) TOWN OF ELMIRA
(Regional Municipality of Waterloo)

BY-LAW PASSED - April 26, 1973

1974 POPULATION (Township of Woolwich) - 15,340

Oil, fat, greas of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	

TOWN OF ELMIRA (Cont'd)

BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	1.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	2.0	" "
Total nickel " " Ni	5.0	" "
Total lead " " Pb	5.0	" "
Total zinc " " Zn	5.0	" "
Total cadmium " " Cd	5.0	" "
Total chlorides " " Cl	1000	" "
Total sulphates " " SO_4	1000	" "
Pesticides	0	
Herbicides	0	

(14) TOWN OF FERGUS

BY-LAW PASSED - April 24, 1972

1974 POPULATION - 5,656

Temperature	150	^{o}F
Fat, oil, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
pH	5.5 - 9.5	
Suspended solids	350	milligrams/litre
BOD	300	" "
Total cadmium expressed as Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total chromium " " Cr	3.0	" "
Total copper " " Cu	3.0	" "
Total cyanides " " HCN	2.0	" "
Total lead " " Pb	3.0	" "
Total nickel " " Ni	3.0	" "
Phenolic compounds	1.0	" "

TOWN OF FERGUS (Cont'd)

Total sulphates expressed as SO_4	1500	milligrams/litre
Total sulphides " " H_2S	2.0	" "
Total zinc " " Zn	3.0	" "

(15) CITY OF GALT (Cambridge)
(Regional Municipality of Waterloo)

BY-LAW PASSED - April 26, 1973

1974 POPULATION (Cambridge) - 68,778

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	1.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	2.0	" "
Total nickel " " Ni	5.0	" "
Total lead " " Pb	5.0	" "
Total zinc " " Zn	5.0	" "
Total cadmium " " Cd	5.0	" "
Total chlorides " " Cl	1000	" "
Total sulphates " " SO_4	1000	" "
Pesticides	0	" "
Herbicides	0	" "

(16) TOWN OF GEORGETOWN (Halton Hills)

BY-LAW PASSED - September 23, 1968

1974 POPULATION (Halton Hills) - 32,808

Oil, fat, grease of animal, vegetable origin	150	milligrams/litre
Oil, grease, tar of mineral origin	15	" "

TOWN OF GEORGETOWN (Cont'd)

Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	350	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.3	" "
Total cyanides expressed as HCN	3.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	4.0	" "
Total chromium " " Cr	5.0	" "
Total nickel " " Ni	5.0	" "
Total lead " " Pb	5.0	" "
Total zinc " " Zn	5.0	" "
Total cadmium " " Cd	4.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(17) VILLAGE OF GRAND VALLEY

BY-LAW PASSED - October 13, 1971

1974 POPULATION - 1,027

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "

VILLAGE OF GRAND VALLEY (Cont'd)

Total zinc expressed as Zn	3.0	milligrams/litre
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(18) CITY OF GUELPH

BY-LAW PASSED - July 27, 1970

1974 POPULATION - 66,082

Temperature	150	^{o}F
Fat, oil, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease of mineral origin	15	" "
pH	5.5 - 9.5	
Suspended solids	350	milligrams/litre
BOD	300	" "
Total sulphides expressed as H_2S	3.0	" "
Total chromium " " Cr	3.0	" "
Total cyanide " " HCN	2.0	" "
Phenolic compounds	0.1	" "
Total copper expressed as Cu	1.0	" "
Total zinc " " Zn	20	" "
Total iron " " Fe	30	" "
Total cadmium " " Cd	3.0	" "
Total lead " " Pb	3.0	" "

(19) TOWN OF HAILEYBURY

BY-LAW PASSED - June 17, 1971

1974 POPULATION - 4,873

Oil, fat, grease, of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	

TOWN OF HAILEYBURY (Cont'd)

BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(20)

TOWN OF HESPELER (CAMBRIDGE)
(Regional Municipality of Waterloo)

BY-LAW PASSED - April 26, 1973

1974 POPULATION (Cambridge) - 68,778

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	1.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	2.0	" "
Total nickel " " Ni	5.0	" "
Total lead " " Pb	5.0	" "
Total zinc " " Zn	5.0	" "

TOWN OF HESPELER (Cont'd)

Total cadmium expressed as Cd	5.0	milligrams/litre
Total chlorides " " Cl	1000	" "
Total sulphates " " SO_4	1000	" "
Pesticides	0	
Herbicides	0	

(21) TOWN OF HUNTSVILLE

BY-LAW PASSED - March 14, 1974

1974 POPULATION - 9,876

Temperature	150	^{o}F
Fat, oil, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease of mineral origin	10	" "
pH	6.0 - 9.0	
Suspended solids	350	milligrams/litre
BOD	300	" "

(22) TOWNSHIP OF IGNACE

BY-LAW PASSED - June 19, 1969

1974 POPULATION - 1,710

Oil, fat, grease of animal vegetable origin	15	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	400	milligrams/litre
Suspended solids	500	" "
Phenolic compounds	0.5	" "
Total cyanides expressed as HCN	5.0	" "
Total sulphides " " H_2S	5.0	" "
Total copper " " Cu	8.0	" "
Total chromium " " Cr	10	" "
Total nickel " " Ni	10	" "
Total lead " " Pb	10	" "

TOWNSHIP OF IGNACE (Cont'd)

Total zinc expressed as Zn	10	milligrams/litre
Total cadmium " " Cd	8.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(23) TOWN OF INGERSOLL

BY-LAW PASSED - June 20, 1970

1974 POPULATION - 8,076

Temperature	150	^{o}F
Fat, oil, grease of animal & vegetable origin	150	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
pH	6.0 - 9.5	
BOD	0.5	milligrams/litre
Total chlorides expressed as Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(24) CITY OF KINGSTON

BY-LAW PASSED - February 1969

1974 POPULATION - 60,425

Temperature	150	^{o}F
Fat, oil, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease of mineral origin	15	" "
pH	5.5 - 9.5	
Total chromium expressed as Cr	3.0	milligrams/litre
Total cyanide " " HCN	2.0	" "
Phenolic compounds (primary treatment)	0.5	" "
Phenolic compounds (secondary ")	1.0	" "
Total copper expressed as Cu	1.0	" "
All other heavy metals, other than iron	5.0	" "

(25) TOWN OF KIRKLAND LAKE

BY-LAW PASSED - February 5, 1974

1974 POPULATION - 13,991

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "

(26) CITY OF KITCHENER
(Regional Municipality of Waterloo)

BY-LAW PASSED - April 26, 1973

1974 POPULATION - 126,162

Temperature	150	^{o}F
Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
pH	5.5 - 9.5	
Total cyanides expressed as HCN	1.0	milligrams/litre
Total copper " " Cu	3.0	" "
Total chromium " " Cr	2.0	" "

CITY OF KITCHENER (Cont'd)

Total cadmium expressed as Cd	5.0	milligrams/litre
Total nickel " " Ni	5.0	" "
Total zinc " " Zn	5.0	" "
Phenolic compounds	0.1	" "
Total chlorides expressed as Cl	1000	" "
Total sulphates " " SO_4	1000	" "
BOD	300	" "
Suspended solids	350	" "
Total sulphides expressed as H_2S	3.0	" "
Total lead " " Pb	5.0	" "
Pesticides	0	" "
Herbicides	0	" "

(27) CITY OF LONDON

BY-LAW PASSED - March 15, 1971

1974 POPULATION - 236,828

Temperature	150	^{o}F
Animal fat, oil, or grease	100	milligrams/litre
pH	5.5 - 9.0	
Total cyanides expressed as HCN	2.0	milligrams/litre
Total arsenic " " As	1.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total silver " " Ag	2.0	" "
Total cadmium " " Cd	5.0	" "
Total nickel " " Ni	5.0	" "
Total iron " " Fe	17	" "
Total zinc " " Zn	15	" "
Other heavy metals	5.0	" "
Phenolic compounds	0.1	" "
Total chlorides expressed as Cl	1500	" "
Total sulphates " " SO_4	1500	" "
Oil, grease, tar of mineral origin	15	" "

CITY OF LONDON (Cont'd)

Total sulphides expressed as H_2S	2.0	milligrams/litre
Total mercury " " Hg	0.5	" "
Suspended solids	350	" "
BOD	300	" "

(28) TOWNSHIP OF LONGLAC

BY-LAW PASSED - June 14, 1971

1974 POPULATION - 1,669

Oil, fat, grease of animal and vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(29) TOWN OF MARKHAM

BY-LAW PASSED - March 17, 1969

1974 POPULATION - 51,056

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F

TOWN OF MARKHAM (Cont'd)

pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	5.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(30) TOWN OF MEAFORD

BY-LAW PASSED - July 2, 1968

1974 POPULATION - 4,161

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	350	milligrams/litre
Suspended solids	400	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total copper " " Cu	3.0	" "
Total sulphides " " H_2S	2.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "

(31) TOWN OF MIDLAND

BY-LAW PASSED - January 9, 1967

1974 POPULATION - 11,117

Temperature	150	^{o}F
Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease of mineral origin	15	" "
pH	5.5 - 9.5	
Suspended solids	350	milligrams/litre
BOD	300	" "
Total chromium expressed as Cr	3.0	" "
Total cyanide " " HCN	2.0	" "
Phenolic compounds	0.1	" "
Total copper expressed as Cu	1.0	" "
Total sulphate " " SO_4	1500	" "
All other heavy metals except iron	5.0	" "

(32) TOWNSHIP OF MOORE

BY-LAW PASSED - September 1, 1970

1974 POPULATION - 8,112

Oil, fat, grease of animal vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.5	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "

TOWN OF MOORE (Cont'd)

Total zinc expressed as Zn	3.0	milligrams/litre
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(33) TOWN OF NEWMARKET

BY-LAW PASSED - July 8, 1963

1974 POPULATION - 22,736

Temperature	150	^{o}F
Fat, oil, grease of mineral origin	10	milligrams/litre
Fat, oil, grease of animal, vegetable origin	100	" "
pH	5.5 - 9.0	
BOD	300	milligrams/litre
Suspended solids	350	" "

(34) CITY OF NORTH BAY

BY-LAW PASSED - October 18, 1971

1974 POPULATION - 50,071

Temperature	150	^{o}F
Fat, oil or grease of animal, vegetable origin	100	milligrams/litre
Oil, grease of mineral origin	15	" "
pH	5.5 - 9.5	
Suspended solids	350	milligrams/litre
BOD	300	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "

TOWN OF NORTH BAY (Cont'd)

Total cadmium expressed as Cd	3.0	milligrams/litre
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(35) TOWN OF ORANGEVILLE

BY-LAW PASSED - October 16, 1972

1974 POPULATION - 11,028

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(36) TOWN OF PARIS

BY-LAW PASSED - May 1, 1972

1974 POPULATION - 6,444

Oil, fat, grease of animal, vegetable origin	40	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F

TOWN OF PARIS (Cont'd)

pH	5.5 - 9.5	
BOD	500	milligrams/litre
Suspended solids	600	" "
Phenolic compounds	1.0	" "
Total cyanides expressed as HCN	1.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(37) TOWN OF PICKERING

BY-LAW PASSED - December 9, 1968

1974 POPULATION - 23,835

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "

TOWN OF PICKERING (Cont'd)

Total cadmium expressed as Cd	3.0	milligrams/litre
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(38) VILLAGE OF POINT EDWARD

BY-LAW PASSED - May 6, 1970

1974 POPULATION - 2,498

Temperature	150	^{o}F
pH	5.5 - 9.5	
Suspended solids	350	milligrams/litre
BOD	300	" "
Phenolic compounds	0.5	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(39) CITY OF PORT DOVER

BY-LAW PASSED - March 14, 1966

1974 POPULATION - 18,755

Temperature	150	^{o}F
Fat, oil, grease of animal, vegetable origin	150	milligrams/litre
Oil, grease of mineral origin	15	" "
pH	6.0 - 9.5	
Phenolic compounds	0.15	milligrams/litre
Total cyanides expressed as HCN	0	" "
Total cadmium " " Cd	1.0	" "

Total chromium expressed as Cr	1.0	milligrams/litre
Total copper " " Cu	3.0	" "
Total zinc " " Zn	15	" "
Total iron " " Fe	17	" "
Total chlorides " " Cl	1000	" "
Total sulphates " " SO_4	1500	" "
Total sulphides " " H_2S	none	" "
BOD	300	" "
Suspended solids	350	" "

(40) VILLIAGE OF PORT McNICOLL

BY-LAW PASSED - December 5, 1972

1974 POPULATION - 1,429

pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "

(41) TOWN OF PRESCOTT

BY-LAW PASSED - April 5, 1971

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "

TOWN OF PRESCOTT (Cont'd)

Total zinc expressed as Zn	3.0	milligrams/litre
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(42) PRESTON (Cambridge)
Regional Municipality of Waterloo

BY-LAW PASSED - April 23, 1973

1974 POPULATION (Cambridge) - 68,778

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	1.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	2.0	" "
Total nickel " " Ni	5.0	" "
Total lead " " Pb	5.0	" "
Total zinc " " Zn	5.0	" "
Total cadmium " " Cd	5.0	" "
Total chlorides " " Cl	1000	" "
Total sulphates " " SO_4	1000	" "
Pesticides	0	" "
Herbicides	0	" "

(43) TOWNSHIP OF RED LAKE

BY-LAW PASSED - August 24, 1967

1974 POPULATION - 2,278

TOWN OF RED LAKE (Cont'd)

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(44) TOWN OF RICHMOND HILL

BY-LAW PASSED - September 25, 1972

1974 POPULATION - 33,789

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	5.0	" "
Total copper " " Cu	3.0	" "
Total sulphides " " H_2S	5.0	" "

TOWN OF RICHMOND HILL (Cont'd)

Total chromium expressed as Cr	3.0	milligrams/litre
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "
Pesticides	0	" "
Herbicides	0	" "

SEPARATED TOWN OF ST. MARY'S

BY-LAW PASSED - February 22, 1972

1974 POPULATION - 4,609

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, tar, grease of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.5	" "
Total cyanides expressed as HCN	3.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	5.0	" "
Total chromium " " Cr	6.0	" "
Total nickel " " Ni	6.0	" "
Total lead " " Pb	6.0	" "
Total zinc " " Zn	6.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(46) CITY OF SAULT STE. MARIE

BY-LAW PASSED - August 26, 1968

1974 POPULATION - 77,788

Temperature	150	°F
Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease of mineral origin	15	" "
pH	5.5 - 9.5	
Suspended solids	350	milligrams/litre
BOD	300	" "
Total chromium expressed as Cr	3.0	" "
Total cyanides " " HCN	2.0	" "
Phenolic compounds	0.5	" "
Total copper expressed as Cu	1.0	" "

(47) TOWN OF SOUTHAMPTON

BY-LAW PASSED - June 12, 1973

1974 POPULATION - 2,119

Temperature	150	°F
Oil, fat, grease of mineral origin	10	milligrams/litre
Oil, fat, grease of animal, vegetable origin	100	" "
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended Solids	350	" "

(48) COUNTY OF SOUTH PEEL

BY-LAW PASSED - December 17, 1968

1974 POPULATION (Regional Municipality of Peel) - 330,632

Oil, fat, grease of animal vegetable origin	150	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	°F
pH	5.5 - 10.5	

COUNTY OF SOUTH PEEL (Cont'd)

BOD	500	milligrams/litre
Suspended solids	600	" "
Phenolic compounds	1.0	" "
Total cyanides expressed as HCN	5.0	" "
Total sulphides " " H_2S	5.0	" "
Total copper " " Cu	8.0	" "
Total nickel " " Ni	10.0	" "
Total chromium " " Cr	10.0	" "
Total lead " " Pb	10.0	" "
Total zinc " " Zn	10.0	" "
Total cadmium " " Cd	8.0	" "

(49) CITY OF STRATFORD

BY-LAW PASSED - April 27, 1970

1974 POPULATION - 24,602

Oil, fat, grease of animal, vegetable origin	150	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	1.0	" "
Total cyanides expressed as HCN	3.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	5.0	" "
Total chromium " " Cr	5.0	" "
Total nickel " " Ni	5.0	" "
Total lead " " Pb	5.0	" "
Total zinc " " Zn	5.0	" "
Total cadmium " " Cd	5.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(50) TOWN OF STURGEON FALLS

BY-LAW PASSED - June 16, 1969

1974 POPULATION - 6,252

Oil, grease, tar of mineral origin	15	milligrams/litre
Oil, fat grease of animal, vegetable origin	100	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(51) CITY OF SUDBURY

BY-LAW PASSED - March 28, 1973

1974 POPULATION - 96,836

Temperature	150	^{o}F
Oil, fat, grease of animal, vegetable origin	150	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
pH	5.5 - 9.5	
BOD	500	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.02 - 0.1	" "

CITY OF SUDBURY (Cont'd)

Total cyanides expressed as HCN	2.0	milligrams/litre
Total sulphides " " H_2S	1.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "
Pesticides	0	" "
Herbicides	0	" "

(52) CITY OF THUNDER BAY

BY-LAW PASSED - March 23, 1970

1974 POPULATION - 107,353

Temperature	150	^{o}F
Oil, fat, grease of animal, vegetable origin	150	milligrams/litre
Oil, grease of mineral origin	15	" "
pH	5.5 - 9.5	
Suspended solids	350	milligrams/litre
BOD	300	" "
Total chromium expressed as Cr	3.0	" "
Total cyanides " " HCN	2.0	" "
Phenolic compounds	0.1	" "
Total copper expressed as Cu	2.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total cadmium " " Cd	3.0	" "
Total zinc " " Zn	3.0	" "
Total sulphides " " H_2S	2.0	" "

(53) TOWN OF TILLSONBURG

BY-LAW PASSED - October 5, 1975

1974 POPULATION - 8,486

Temperature	150	^{o}F
Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease of petroleum, synthetic origin	15	" "
pH	5.5 - 9.5	
Suspended solids	350	milligrams/litre
BOD	300	" "
Total chromium expressed as Cr	3.0	" "
Total cyanide " " HCN	2.0	" "
Phenolic compounds	0.1	" "
Total copper expressed as Cu	1.0	" "

(54) CITY OF TIMMINS

BY-LAW PASSED - November 5, 1968

1974 POPULATION - 82,658

Oil, fat, grease of animal, vegetable origin	150	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	350	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.5	" "
Total cyanides expressed as HCN	3.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "

Total cadmium expressed as Cd	3.0	milligrams/litre
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(55) TOWNSHIP OF TISDALE (District City of Timmins)

BY-LAW PASSED - November 22, 1972

1974 POPULATION (District City of Timmins) - 42,981

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	2.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	3.0	" "
Total nickel " " Ni	3.0	" "
Total lead " " Pb	3.0	" "
Total zinc " " Zn	3.0	" "
Total cadmium " " Cd	3.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(56) SEPARATED TOWN OF TRENTON

BY-LAW PASSED - June 2, 1969

1974 POPULATION - 14,481

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	

SEPARATED TOWN OF TRENTON (Cont'd)

BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides expressed as HCN	3.0	" "
Total sulphides " " H_2S	2.0	" "
Total copper " " Cu	4.0	" "
Total chromium " " Cr	4.0	" "
Total nickel " " Ni	4.0	" "
Total lead " " Pb	4.0	" "
Total zinc " " Zn	4.0	" "
Total cadmium " " Cd	4.0	" "
Total chlorides " " Cl	1500	" "
Total sulphates " " SO_4	1500	" "

(57) CITY OF WATERLOO
(Regional Municipality of Waterloo)

BY-LAW PASSED - April 23, 1973

1974 POPULATION - 277,284

Oil, fat, grease of animal, vegetable origin	100	milligrams/litre
Oil, grease, tar of mineral origin	15	" "
Temperature	150	^{o}F
pH	5.5 - 9.5	
BOD	300	milligrams/litre
Suspended solids	350	" "
Phenolic compounds	0.1	" "
Total cyanides, expressed as HCN	1.0	" "
Total sulphides " " H_2S	3.0	" "
Total copper " " Cu	3.0	" "
Total chromium " " Cr	2.0	" "
Total nickel " " Ni	5.0	" "
Total lead " " Pb	5.0	" "
Total zinc " " Zn	5.0	" "
Total cadmium " " Cd	5.0	" "

CITY OF WATERLOO (Cont'd)

Total chlorides expressed as Cl	1000	milligrams/litre
Total sulphates " " SO_4	1000	" "
Pesticides	0	" "
Herbicides	0	" "

3.6 Observations Based on Summary

A survey of the 57 Ontario municipalities included in this section showed that nine items, all metals, were omitted from greater than 90% of the sewer-use by-laws in Ontario. Eight percent of the sewer-use by-laws surveyed do not regulate metals at all. It is desirable that the waste characteristics of all sewage plant influents be standarized as much as possible across the province. This, in part, can be achieved by the strict implementation of a province-wide sewer-use by-law which provides for the control of a maximum number of contaminants. At the present time, however, this is not the case. Individual municipalities are free to adjust the recommended provincial by-law to suit local conditions. This is illustrated by the following table which lists some common constituents of municipal sewage in Ontario. The percentages quoted indicate the number of municipalities in the overall sample which regulate that parameter via a sewer-use by-law.

cyanide	-	89%
copper	-	89%
chromium	-	89%
cadmium	-	80%
sulphate	-	80%
nickel	-	78%
lead	-	78%
zinc	-	78%
chloride	-	75%
iron	-	8%
arsenic	-	5%
mercury	-	3%
aluminum	-	3%

barium	-	3%
fluoride	-	3%
phosphorus	-	3%
tin	-	3%
molybdenum	-	2%

"all heavy metals other than iron" - 7%

Although individual municipalities are free to adjust the recommended provincial by-law to suit local conditions, it was noted that a few Ontario municipalities permitted what would normally be regarded as abnormally high levels of specific substances to be discharged to local sewers. For instance:

COMMUNITY A POPULATION - 66,082
Total zinc expressed as Zn - 20 milligrams/litre
Total copper expressed as Cu - 30 milligrams/litre

COMMUNITY B POPULATION - 18,755
Total zinc expressed as Zn - 15 milligrams/litre

COMMUNITY C POPULATION - 236,828
Total zinc expressed as Zn - 15 milligrams/litre

Again, a stable and comparable influent to all sewage treatment plants in the province is desirable. This can only be achieved by the implementation of a uniform province-wide by-law in which the various parameters are fixed or at least are not permitted to fluctuate widely.

At the present time, however, the by-law structure does permit wide fluctuations. For instance, 62% of the municipalities in the overall sample regulated cadmium at a level of three milligrams/litre, 24% at a level of five milligrams/litre, 4% at levels of two, four and eight milligrams/litre, respectively, and 2% at a level of one milligram/litre. Similar fluctuations are indicated by the following data.

Parameter	Concentrations Quoted in Individual Municipal by-laws milligrams/litre	% of Municipalities Using Concentration Quoted
Aluminum (as Al)	50	50%
	5.0	50%
Arsenic (as As)	1.0	100%
Barium (as Ba)	5.0	100%
Cadmium (as Cd)	8.0	4%
	5.0	24%
	4.0	4%
	3.0	62%
	2.0	4%
	1.0	2%
Chloride (as Cl^-)	1500	84%
	1000	16%
Chromium (as Cr)	10.0	4%
	6.0	2%
	5.0	11%
	4.0	2%
	3.0	68%
	2.0	11%
	1.0	2%
Copper (as Cu)	8.0	4%
	5.0	11%
	4.0	4%
	3.0	68%
	2.0	2%
	1.0	11%
Cyanide (as HCN)	5.0	6%
	3.0	15%
	2.0	64%
	1.0	13%
	0	2%
Fluoride (as F)	10.0	100%
Iron (as Fe)	50	20%
	30	20%
	17	40%
	10.0	20%
Lead (as Pb)	10.0	4%
	6.0	2%
	5.0	24%
	4.0	2%
	3.0	68%

Parameter	Concentrations Quoted in Individual Municipal by-laws milligrams/litre	% of Municipalities Using Concentration Quoted
Mercury (as Hg)	.10	100%
Molybdenum (as Mo)	5.0	100%
Nickel (as Ni)	10.0	4%
	6.0	2%
	5.0	31%
	4.0	2%
	3.0	61%
Phenolic compounds	1.0	14%
	.50	16%
	.30	2%
	.15	2%
	.10	64%
	.02	2%
Phosphorus (as P)	100	100%
Sulphate (as SO_4)	1500	86%
	1000	14%
Sulphide (as H_2S)	5.0	9%
	3.0	29%
	2.0	58%
	1.0	2%
	0	2%
Tin (as Sn)	5.0	100%
Zinc (as Zn)	15	4%
	10	4%
	8.0	4%
	6.0	2%
	5.0	27%
	4.0	2%
	3.0	55%
	2.0	2%
Oil, fat, grease of animal vegetable origin	150	20%
	100	78%
	15	1%
	40	1%
Oil, fat, grease of mineral origin	15	93%
	10	7%

Parameter	Concentrations Quoted in Individual Municipal by-laws milligrams/litre	% of Municipalities Using Concentration Quoted
BOD	500	5%
	400	2%
	350	5%
	300	88%
Suspended Solids	600	3%
	500	2%
	400	2%
	350	93%
Temperature	$150^{\circ}F$	100%
pH	5.5 - 9.5	86%
	6.0 - 9.0	3%
	5.5 - 9.0	3%
	6.0 - 9.5	6%

4. METAL SOURCES IN SANITARY EFFLUENTS FROM RESIDENTIAL AREAS

4.1 Introduction

Waste discharges from residential areas differ significantly from waste discharges from industrial sources. In general, domestic discharges from individual residences may be categorized as low volume chemically complex effluents, whereas industrial sources tend to generate high volume waste flows that quite often incorporate a known and/or a limited chemical spectrum.

In this section, an attempt is made to delineate the sources of metals which commonly find use in residential areas and, therefore, commonly occur in the domestic effluents originating in these areas. Up to the present time, the chemical and physical complexity of effluents originating in residential areas have not been fully appreciated. In many cases, effluents from these areas present waste treatment problems that are more complex than industrial sources of equivalent volume.

In fact, nearly every metal or chemical substance known or used by man may, at one time or another, appear in the effluents from residential areas. This is due, in part, to the great number of chemical products available to an individual or to a household for limited or long-term private use.

In addition, certain products available commercially find standard use in most homes and contribute significantly to metal loadings in municipal sewers. Such products include soaps and detergents used for washing dishes and clothes, bath products, products related to personal hygiene, cosmetics, medicines and household cleaners.

Very few of us realize that everyday tasks such as brushing our teeth, shampooing our hair, washing our hands, removing cosmetics and having a bath or shower contribute to the metal-related problems that presently occur at sewage treatment plants. However, this unfortunately is very true. Toothpaste, for instance, nowadays commonly contains tin (stannous) fluoride. This is eventually washed down the drain. Popular drandruff shampoos contain selenium compounds. When we wash our hair, these compounds are discharged to the sewerage system. When we bath or shower, residual amounts of deodorants (aluminum compounds) and various

cosmetics go down the drain and so forth. Whether we are cleaning the sink, silverware or old paint brushes, the resultant waste solutions usually go down the drain.

A single individual who is brushing his or her teeth cannot be considered a significant source of tin as far as a sewage treatment plant is concerned; but 100,000 individuals routinely brushing their teeth are a significant source.

There are other factors that also determine the chemical complexity of the wastes that flow in a sanitary sewer. For instance, the sewer does not normally receive wastes from only private residences. Additional sources commonly include apartment complexes, restaurants, hotels, institutions such as hospitals, laboratories, car washes, coin laundries, warehouses, automobile garages, and large and small shopping complexes none of which are considered to be "industrial" sources in the strict sense of the word.

The complete elimination of all industrial discharges to sanitary sewers would significantly lower the metal concentrations in sewage plant influents, sludges and effluents. However, significant metal problems would still remain because of the metal content of modern day 'domestic' sewage.

This Section of this report is divided into two units. Unit A is a product index where products that are commonly used in and around a household are broken down into general categories (e.g. 'medicines') and where the general chemistry of each category is summarized. Unit B, a metal index, groups typical household products according to the metal, nonmetal or substance of interest that they contain.

4.2 Source Indexes

4.2.1 Unit A - Product Index

Products

(1)	Automotive Products	(5)	Cosmetics
(2)	Bleaches	(6)	Deodorizers
(3)	Caulking Compounds	(7)	Disinfectants
(4)	Cleaners	(8)	Driers

(9) Dyes
(10) Fillers
(11) Fires Extinguishers
(12) Fuels
(13) House and Garden Pesticides
(14) Inks
(15) Laundry Products
(16) Lubricants
(17) Oils
(18) Ointments
(19) Paints
(20) Photographic Products
(21) Pigments
(22) Polish
(23) Powders
(24) Preservatives
(25) Sanitizers
(26) Soaps
(27) Suppositories
(28) Water Treating Chemicals
(29) Medicine

(1) AUTOMOTIVE PRODUCTS

Antifreeze

1. Methanol

   Rust Inhibitors - chromates
   - zinc chloride

2. Ethylene Glycol
   - arsenic compounds
   - sodium mercaptobenzothiazole

3. Miscellaneous
   - calcium chloride
   - sodium chloride

Automatic Transmission Fluids

- zinc dialkyl dithiophosphate
- barium and calcium petroleum sulfonates
- barium and calcium alkyl phenolates

Carburetor Cleaners

- potassium hydroxide
- sodium chromate
- ammonium oxalate

AUTOMOTIVE PRODUCTS (Cont'd)

Corrosion Inhibitors

1. Chromate Type
   - sodium chromate
   - silicates
   - potassium bichromate
   - phosphates
2. Sodium Nitrate Type
   - sodium nitrate
3. Straight Alkali Type
   - sodium carbonate
   - sodium metasilicates
   - sodium phosphates

Dressings

1. Leather or Rubber Coating
   - titanium dioxide
   - aluminum stearate
   - cobalt
   - lead

Radiator Cleaners (Flushes)

1. Alkaline
   - sodium orthosilicate
   - sodium tripolyphosphate
   - sodium dichromate
   - sodium chromate
2. Acid
   - sodium bisulphite
3. Mixed
   - potassium dichromate
   - sodium carbonate

Radiator Stop Leak

- aluminum oxide

AUTOMOTIVE PRODUCTS (Cont'D)

Tire Cleaners

- potassium hydroxide
- phosphates
- metasilicates

White tire paint

- titanium dioxide
- silicates
- calcium carbonate

Undercoatings

- iron oxide
- titanium dioxide
- silicates
- lead or lead salts
- zinc or zinc salts

Chassis Lubricants

- aluminum soap
- molybdenum disulphide

Generator Powder

- aluminum sulphate

Automotive Cleaners and Car Wash Compounds

- alkyl aryl sodium sulfonate
- sodium sulphate

Engine and Motor Cleaners

- potassium hydroxide

Foam Suppressors

- calcium acetate
- calcium ricinoleate

(2) BLEACHES

Household Bleaches, Powder

1. Chlorine Type
   - sodium silicate

BLEACHES (Cont'd)

2. Oxygen Type

- sodium silicate

Wood Bleaches

- sodium silicate
- sodium hydrosulphide

Commercial Bleaches (Laundry)

- sodium dithionate (sodium hydrosulphate)
- sodium perborate
- sodium perioxide
- trisodium phosphate

Laundry Bleaches, Liquid

- sodium hypochlorite
- sodium hydroxide
- sodium carbonate
- sodium chloride

Household Bleaches, Liquid

- sodium hypochlorite
- sodium chloride
- sodium hydroxide and/or sodium carbonate

Household Bleaches, Powder

- sodium tripolyphosphate
- sodium silicate
- sodium sulphate

(3) CAULKING COMPOUNDS

Compounds

- titanium dioxide
- aluminum, calcium stearates
- chromium
- iron oxide
- zinc oxide
- lead
- cobalt drier
- calcium carbonate

CAULKING COMPOUNDS (Cont'd)

Cement Sealer

- titanium dioxide
- silicates

Polysulphide Caulking Compound

- titanium dioxide
- potassium phosphate
- barium oxide, peroxide

Silicone Rubber Caulking

- silica
- aluminum flake
- titanium dioxide

(4) CLEANERS

Abrasive Cleaner

- silica
- phosphates
- sodium sulphate
- potassium persulphate
- sodium carbonate, hypochlorite, perchlorate, stearates

Aluminum Cleaners

- sodium metasilicate
- tripolyphosphate
- bicarbonate
- fluoride
- magnesium silicofluoride

Toilet Bowl Cleaners (Acid Cleaners)

1. Solid
    - sodium acid sulphate
    - sodium sulphate
    - sodium chloride
    - sodium carbonate

CLEANERS (Cont'd)

2. Liquid
   - sodium metasilicate
   - sodium nitrate
   - sodium tripolyphosphate
   - zinc chloride
   - sodium fluoride
   - sodium carbonate
   - trisodium phosphate
   - potassium dichromate

Boiler Treatments

- sodium carbonate
- trisodium phosphate
- sodium dichromate
- sodium borate

Chrome Cleaners

- ammonium hydroxide
- ammonium oxalate

Coffee Pot Cleaners

- tripolyphosphate
- sodium metasilicate
- sodium sulfonate
- sodium bicarbonate

Dairy Cleaners

1. Alkaline
   - sodium hydroxide
   - sodium tripolyphosphate
   - sodium bicarbonate
2. Sanitizers
   - sodium carbonate
   - sodium tripolyphosphate

Denture Cleaners

- sodium perborate
- sodium chloride

CLEANERS (Cont'd)

Denture Cleaners (Cont'd)

- magnesium sulphate
- calcium chloride
- sodium carbonate
- trisodium phosphate
- potassium monopersulphate
- sodium peroxide
- calcium phosphates

Detergents, Automatic Dishwasher

Household

- Low Alkalinity - sodium tripolyphosphate
  - sodium silicate
  - trisodium phosphate
  - sodium hypochlorite
- High Alkalinity - sodium metasilicate
  - sodium tripolyphosphate
  - sodium carbonate
  - potassium dichloro-s-triazinetrione

Detergents, Granulated and Tablet

- sodium phosphate
- sodium sulphate
- sodium chloride
- sodium silicate
- sodium carbonate
- sodium perborate

Detergents, Liquid

- sodium toluenesulfonate
- potassium toluenesulfonate
- potassium pyrophosphate
- sodium silicate
- sodium nitrate
- sodium sulphate
- ammonium sulphate

CLEANERS (Cont'd)

Detergents, Liquid (Cont'd)

- sodium tripolyphosphate
- trisodium phosphate
- potassium hydroxide

Diaper Cleaners

- sodium metasilicate
- trisodium phosphate
- sodium perborate
- sodium tripolyphosphate

Disinfectant Cleaners

- sodium metasilicate
- trisodium phosphate
- sodium perborate
- sodium tripolyphosphate
- sodium carbonate
- sodium sulphite or nitrite
- potassium hydroxide
- sodium hydroxide

Drain and Pipe, Powder

- sodium hydroxide
- potassium hydroxide
- sodium nitrate
- aluminum particles
- sodium chloride
- sodium carbonate

Egg Cleanser

- sodium tripolyphosphate
- sodium metasilicate
- sodium carbonate

CLEANERS (Cont'd)

Floor Cleaners

- sodium polyphosphates
- sodium perborate
- sodium metasilicate
- trisodium phosphate
- potassium hydroxide
- silica
- zinc stearate

Furnace and Fireplace

- potassium nitrate
- sodium chloride
- ammonium chloride
- copper sulphate
- red iron oxide
- magnesium carbonate
- copper 6% liquid linoresinate
- zinc 8% liquid linoresinate
- copper chloride

General Cleaner

- trisodium phosphate
- sodium carbonate
- sodium sesquicarbonate
- sodium pyrophosphate
- sodium tripolyphosphate
- sodium silicate
- sodium sulfonate
- silicon alkyl, aryl sulfonate
- sodium potassium phosphate
- potassium hydroxide

Glass (Window Cleaners)

- sodium polyphosphate
- phosphates
- ammonium hydroxide

CLEANERS (Cont'd)

Leather Cleaners

Saddle soap - potassium carbonate
- sodium metasilicate

Metal Cleaners

- trisodium phosphate
- sodium metasilicate
- potassium soap
- chromic acid
- phosphoric acid
- sodium carbonate
- tripolyphosphates
- ammonium citrate
- silicon dioxide
- calcium chloride
- magnesium silico-fluoride

Monument Cleaners

- ammonium bifluoride
- sodium bifluoride
- sodium hydrosulphite
- hydrogen peroxide

Paint and Varnish Cleaners

- trisodium phosphate
- sodium carbonate
- ammonia
- tetrasodium pyrophosphate
- ammonium chloride

Paint and Varnish Removers

- potassium oleate
- potassium bitartrate or citrate
- sodium sesquicarbonate
- trisodium phosphate

CLEANERS (Cont'd)

Porcelain, Marble, Tile and Enamel Cleaners

- sodium tripolyphosphate
- trisodium phosphate
- silica
- sodium metasilicate

Rug And Upholstery Cleaners

- sodium carbonate
- trisodium phosphate
- sodium lauryl sulphate
- sodium silicate
- sodium sulphate
- sodium bicarbonate
- sodium chloride

Sewer, Cesspool, Septic Tank Cleaners

- sodium hydroxide
- potassium hydroxide
- aluminum particles
- sodium carbonate
- sodium bisulphate
- sodium chloride
- copper sulphate
- aluminum sulphate

Shoe Cleaners

- titanium dioxide
- trisodium phosphate

Stainless Steel Cleaners

- sodium chloride
- sodium acid phosphates

Stain, Spot, Lipstick, Rust Remover

- sodium hypochlorite
- ammonium hydroxide
- sodium sulphate

CLEANERS (Cont'd)

Stain, Spot, Lipstick, Rust Remover (Cont'd)

- tetrapotassium pyrophosphate
- sodium thiosulphate

Steam Cleaner

- trisodium phosphate

Stove and Oven Cleaner

- potassium hydroxide
- sodium hydroxide
- silica
- sodium orthosilicate
- sodium xylene sulfonate
- sodium hydroxide base

Teflon Cleaner

- sodium perborate
- sodium metasilicate

Wall Cleaners

- ammonium hydroxide
- silica
- sodium lauryl sulphate
- trisodium phosphate

Wallpaper Cleaners

- ammonium alum
- ammonium hydroxide
- trisodium phosphate

Wallpaper Remover

- sodium tetradecyl sulphate

Windshield Washer Solvents

- potassium phosphate

(5) COSMETICS

Baby Preparations

Powder

- zinc oxide
- magnesium carbonate

Barrier Creams (Protective)

- ammonium hydroxide
- zinc oxide
- zinc stearate
- titanium dioxide
- potassium hydroxide
- magnesium stearate
- aluminum compounds
- sodium silicates

Bath Preparations

Bath salts

- sodium bicarbonate
- trisodium phosphate
- sodium chloride
- sodium hexametaphosphate

Bubble bath

- sodium lauryl sulphate
- sodium chloride
- sodium sulphate
- sodium tripolyphosphate

Bleach and Freckle Creams and Ointments

- ammoniated mercury
- bismuth subnitrate
- mercuric chloride
- mercuric oxide
- mercurous chloride
- zinc oxide
- zinc peroxide
- potassium sulphide

COSMETICS (Cont'd)

Bleach and Freckle Creams and Ointments (Cont'd)

- zinc sulphide
- aluminum oxide particles
- titanium dioxide

Freckle Lotions

- potassium chlorate
- potassium carbonate
- sodium borate
- ammoniated mercury
- bismuth subnitrate

Skin Creams

- sodium lauryl sulphate
- aluminum chlorhydroxide
- ammoniated mercury
- zinc oxide

Dentifrices

1. Liquid
    - sodium alginate
    - sodium lauryl sulphate
2. Toothpaste
    - dicalcium phosphate
    - sodium lauryl sulphate
    - alumina hydrate
    - titanium dioxide
3. Tooth Powder
    - tricalcium phosphate
    - sodium methaphosphate
    - sodium lauryl sulfoacetate
    - stannous fluoride
    - aluminum hydrate
    - ammonium phosphate
    - calcium carbonate
    - calcium pyrophosphate

COSMETICS (Cont'd)

Dentifrices (Cont'd)

- calcium sulphate
- magnesium carbonate
- magnesium oxide
- magnesium phosphate
- potassium chlorate
- sodium benzoate
- sodium bicarbonate
- sodium fluoride

Deodorants and Antiperspirants

1. Cream Antiperspirants
   - aluminum chlorhydroxide
2. Deodorant and Antiperspirant Cream
   - aluminum chloride
   - aluminum sulphate
   - magnesium oxide
   - sodium lauryl sulphate
   - aluminum phenolsulfonate
3. Deodorant Stick
   - sodium stearate
   - zinc oxide
4. Liquid Antiperspirant
   - aluminum chloride
5. Roll-On Deodorant Antiperspirant
   - aluminum chlorhydroxide complex
   - aluminum chloride, sulphate
6. Spray Deodorant (with antiperspirant action)
   - aluminum chloride
   - magnesium oxide
   - aluminum, zinc phenolsulfonate (foot spray)
7. Deodorant Jell
   - aluminum subacetate

COSMETICS (Cont'd)

Depilatories

Cream

- calcium thiogycolate
- calcium carbonate
- calcium hydroxide
- sodium lauryl sulphate
- barium sulphide
- zinc oxide

Eye Make-up

1. Eybrow pencils
   - aluminum silicates
   - iron oxide
2. Eye Cream
   - sodium benzoate
3. Eye Shadow
   - calcium carbonate
   - lithium stearate
   - titanium dioxide
   - aluminum powder
4. Eyeliner
   - titanium dioxide
5. Mascara
   - iron oxide

Face Make-up

Face packs

- zinc stearate
- zinc oxide
- magnesium carbonate
- titanium oxide
- zinc sulfocarbolate

Wax

- mercurized wax

COSMETICS (Cont'd)

Foundation Creams

- zinc stearate
- sodium alginate

Hair Preparations

Dyes, Tints

- silver nitrate
- ammonia
- bismuth acetate
- cadmium chloride
- cobalt chloride
- cupric chloride
- ferric chloride
- lead acetate
- manganese sulphate
- nickel sulphate
- sodium sulphite
- sodium thiosulphate
- ferrous sulphate
- copper sulphate

Lacquers and Wave Sets

- sodium alginate

Permanent Waves

- sodium lauryl sulphate
- sodium bromate
- potassium bromate
- sodium perborate

Straighteners

- ammonium thioglycolate
- ammonium hydroxide

Liquefying Creams

- sodium borate

COSMETICS (Cont'd)

Liquid Make-Up

Liquid Powders

- titanium dioxide
- sodium hydroxide
- calcium carbonate
- magnesium carbonate
- magnesium oleate
- zinc oxide
- zinc stearate
- magnesium calcium carbonate
- magnesium aluminum silicate

Mouthwashes

- sodium bicarbonate
- sodium chloride
- sodium cyclamate
- zinc chloride
- ammonium phosphate
- potassium iodide
- zinc oxide
- zinc phenosulfonate

Nail Cosmetics

1. Cuticle Softener
   - potassium hydroxide
   - sodium carbonate
   - trisodium phosphate
2. Nail Bleaches
   - potassium binoxalate
3. Nail Whites
   - Cream - titanium dioxide
   - Liquid - titanium dioxide

Perfumes, Toilet Waters and Colognes

- sodium stearate

COSMETICS (Cont'd)

Powders

Body Powder

- calcium carbonate
- zinc stearate

Face Powder

- zinc oxide
- calcium carbonate
- magnesium carbonate
- barium sulphate
- titanium dioxide
- magnesium stearate
- iron oxide

Rouges

Cake

- zinc oxide
- zinc stearate

Cream

- potassium hydroxide
- titanium dioxide

Liquid

- ammonium hydroxide

Paste

- ammonium hydroxide

Shampoos

Soap Shampoo

- potassium coconut oil soap
- potassium oil soap

Soapless Shampoo

- sodium lauryl sulphate
- sodium stearate
- trisodium phosphate

COSMETICS (Cont'd)

Shampoos (Cont'd)

- potassium soap
- zinc pyrithione
- cadmium sulphide
- magnesium sulphide
- cadmium lauryl sulphate
- magnesium lauryl sulphate
- cadmium stearate
- magnesium stearate

Shaving Creams and Lotions

Shaving Cream (Brushless Type)

- sodium alginate
- sodium salicylate
- zinc compounds

Shaving Cream (Lather Type)

- sodium and potassium stearine soap
- sodium and potassium coconut oil soap
- sodium alginate
- sodium salicylate
- zinc compounds
- ammonium stearates

Shaving Lotions

- aluminum chlorhydroxy allantoinate
- potassium alum
- zinc phenolsulfonate
- aluminum phenolsulfonate

Shaving Powder

- barium sulphide

Styptic Pencil

- potassium aluminum sulphate

Astringent

- zinc sulphate
- aluminum chlorhydroxide
- zinc oxide
- aluminum acetate

COSMETICS (Cont'd)

Lipsticks

- titanium dioxide
- bismuth oxychloride

Hand Lotion

- magnesium stearate
- zinc oxide
- zinc carbonate
- titanium dioxide

Skin Fresheners

- ammoniated mercury
- bismuth subnitrate
- zinc sulphate
- aluminum chlorhydroxide
- zinc oxide
- aluminum acetate

(6) DEODORIZERS

Bathroom Deodorant

- sodium bisulphate

Cleanser Type

- magnesium sulphate
- ammonium chloride

Garbage Can

- sodium chloride
- sodium hypochlorite

Spray Type Deodorizers

- zinc phenolsulfonate

(7) DISINFECTANTS

Alkalis

- ammonium hydroxide
- sodium hydroxide
- sodium carbonate

DISINFECTANTS (Cont'd)

Alkalis (Cont'd)

- calcium hydroxide
- sodium silicates
- trisodium phosphates

Dairy Disinfectants

- calcium hypochlorite
- sodium chloride
- phosphates
- alkyl sodium sulphate
- potassium permanganate

Halogens

Liquid

- sodium hypochlorite
- sodium hydroxide
- sodium chloride
- calcium hypochlorite
- sodium borate

Miscellaneous Disinfectants

- mercury compounds

Phenol Disinfectants

- complex phosphates

Pine Oil

- potassium tetrapyrophosphate

Quaternary Ammonium Compounds

- sodium carbonate
- sodium tripolyphosphate

(8) DRIERS

Air

- calcium chloride
- aluminum chloride

DRIERS (Cont'd)

Air (Cont'd)

- potassium chloride
- sodium tripolyphosphate

(9) DYES

Rug

- sodium chloride
- sodium sulphate

(10) FILLERS

Joint Compound

- aluminum silicate
- aluminum oxide
- titanium dioxide

Soldering Paste

- zinc halide

(11) FIRE EXTINGUISHERS

Foam Fire Extinguishers

- iron salts
- zinc salts
- magnesium stearate
- aluminum sulphate
- sodium bicarbonate

Liquid Fire Extinguishers

- sodium hydroxide
- sodium dichromate

Powder Extinguishers

- sodium and/or potassium bicarbonate
- zinc stearates
- aluminum stearates
- magnesium stearates
- ammonium monophosphate
- potassium sulphate

(12) FUELS

Motor Fuel

- tetraethyl lead
- trimethyl phosphate
- tetramethyl lead

Motor Fuel Additive

- trimethyl phosphate
- ethylene dibromide
- tetraethyl lead
- ethylene dichloride
- barium soaps of the oxidate
- copper napthenate

(13) HOUSE AND GARDEN PESTICIDES

Ant

- arsenic
- calcium cyanide
- iron oxide
- lead arsenate
- metallic arsenate
- silica
- sodium
- sodium arsenate
- sodium carbonate
- sodium chloride
- sodium cyanide
- sodium fluoride
- sodium silicofluoride
- sodium arsenite
- arsenic trioxide
- thallium sulphate

Flower Garden Pesticides

- arsenic
- calcium arsenate

HOUSE AND GARDEN PESTICIDES (Cont'd)

Flower Garden Pesticides (Cont'd)

- copper
- copper oxychloride
- copper zinc chromate

Garden Pesticides

- copper
- arsenic
- copper-zinc sulphates
- lead arsenate
- sodium aluminum fluoride
- tricalcium arsenate
- zinc

Grass and Weed Killer

- sodium arsenite
- sodium chlorate
- sodium metaborate
- potassium cyanate

Lawn Pesticides

- cadmium compounds
- lead arsenate
- organic mercury compounds
- sodium trichloroacetate
- mercurous chloride
- potassium chromate
- cadmium succinate
- ferrous sulphate

Roaches

- lead arsenate
- mercuric chloride
- sodium borate
- sodium chloride
- sodium fluoride

HOUSE AND GARDEN PESTICIDES (Cont'd)

Roaches (Cont'd)

- sodium silicofluoride
- sodium sulphate

Termites

- arsenic trioxide
- copper resinate

Moth Spray

- zinc silicofluoride

Peach Spray

- zinc sulphate
- lead arsenate

Tomato Dust

- copper sulphate

Mouse

- zinc phosphide
- arsenic trioxide

Soil Nutrient

- manganese
- copper
- zinc
- iron
- boron
- molybdenum

(14) INKS

Pigmented Inks

- titanium dioxide
- zinc oxide
- copper salts
- aluminum powder

Marking Inks

- strontium zinc sulphide
- aluminum powder

(15) LAUNDRY PRODUCTS

Laundry Bluing

- sodium sulphate
- sodium tripolyphosphate
- sodium bicarbonate

Laundry Starch

- sodium chloride
- sodium hexameta phosphate
- sodium tripolyphosphate

(16) LUBRICANTS

Greases

- barium compounds
- chromate
- lead compounds
- molybdenum disulphide
- zinc salt

(17) OILS

Gear Oils

- lead soaps, napthenate
- barium, calcium petroleum sulfonates
- barium, calcium phenolates
- zinc dialkyl dithiophosphate

Miscellaneous Oils

- phosphorus
- zinc
- barium

Motor Oils

- zinc dialkyl dithiophosphate
- phosphorus pentasulfide
- barium and calcium petroleum sulfonate

(18) OINTMENTS

Skin

- ammoniated mercury
- zinc carbonate
- zinc oxide
- aluminum acetate
- aluminum sulphate
- sodium sulphate
- zirconium oxide
- bismuth subnitrate
- mercury bichloride
- ammonium chloride
- copper sulphate

Ophthalmic

- mercuric oxide
- ammoniated mercury
- zinc oxide
- zinc sulphate
- potassium chloride
- sodium carbonate
- cobalt sulphate
- yellow mercuric oxide

Fungicidal

- copper caprylate
- sodium caprylate
- zinc caprylate
- mercury salicylate

(19) PAINT

Antialgae Paints

- cuprous oxide
- arsenic oxide
- copper sulphate pentahydrate
- mercury soap
- mercuric oxide

PAINT (Cont'd)

Antialgae Paints (Cont'd)

- arsenic compounds
- magnesium silicate
- titanium dioxide
- zinc oxide
- barium metaborate monhydrate
- phenylmercury oleate

Anticorrosion Paints

- zinc chromate
- lead chromate
- red lead oxide
- basic lead carbonate
- zinc oxide
- lead monoxide
- ammonium hydroxide
- arsenic
- cuprous oxide
- mercuric oxide
- metallic soap

Driers

- vanadium compounds
- manganese compounds
- zinc compounds
- iron compounds
- cobalt compounds
- potassium hydroxide
- lead naphthenate
- lead octoate
- lead tallate

Lacquers

- lead acetate
- magnesium oxide

PAINT (Cont'd)

Flat Wall Paint Oil, Primers and Sealers

- titanium dioxide
- titanium calcium
- titanium magnesium
- zinc oxide
- magnesium silicate
- silicates, mercury, lead

Varnishes, Shellacs

- sodium hydroxide
- lead

Traffic Paint

- lead chromate
- lead molybdate
- lead sulphate
- titanium calcium
- magnesium silicate
- calcium carbonate
- aluminum stearate

Gloss Enamel and Floor Enamels

- titanium dioxide
- titanium calcium
- aluminum silicate
- aluminum iron
- red iron oxide
- silicates
- zinc chromate

House Paint, Trim Paint, Exterior Oil, Exterior Primers

- titanium dioxide
- titanium calcium
- zinc oxide
- white lead
- titanium magnesium

PAINT (Cont'd)

House Paint, Trim Paint, Exterior Oil, Exterior Primers (Cont'd)

- magnesium silicate
- calcium sulphate
- calcium carbonate
- magnesium silicate

Latex House Paint

- titanium dioxide
- zinc oxide
- magnesium silicate

Latex Wall Paint, Texture Coatings, Fillers

- titanium dioxide
- barium metaborate

Semi-Gloss, Satin or Eggshell Enamel

- titanium dioxide
- titanium calcium
- silica, calcium carbonate

Floor Paint

- titanium calcium
- titanium dioxide
- magnesium carbonate
- barium sulphate, silicates

Aluminum Roof Paint

- aluminum powder

Heat Resistant Paint

- chrome
- iron
- aluminum
- copper
- titanium

Stain

- lead
- ferric oxide

PAINT (Cont'd)

Stain (Cont'd)

- silicates
- titanium dioxide

Metal Primer

- red iron oxide
- red lead
- zinc chromate
- magnesium silicate

Copper Paint

- cuprous oxide
- red iron oxide
- magnesium silicate

Patio Paints

- lead

Barn Paints

- red iron oxide
- calcium sulphate
- aluminum, magnesium silicates
- cuprous oxide
- lead oxide
- silicates

(20) PHOTOGRAPHIC PRODUCTS

Developers

- potassium bromide
- potassium iodide
- potassium metabisulphite
- sodium, potassium thiocyanate
- sodium bisulphite
- sodium carbonate, hydroxide
- sodium metaborate
- sodium sulphate

PHOTOGRAPHIC PRODUCTS (Cont'd)

Fixing Baths

- sodium thiosulphate
- sodium sulphite
- potassium aluminum sulphate
- ammonium chloride
- sodium bisulphite
- potassium chromium sulphate
- potassium metabisulphite
- potassium thiocyanate

Hardeners

- aluminum chloride
- sodium carbonate
- sodium sulphite or bisulphite
- aluminum chloride
- aluminum sulphate
- aluminum acetate
- stannic chloride

Hypo Test Solution

- silver nitrate
- potassium permanganate
- sodium hydroxide
- mercuric chloride
- potassium bromide
- potassium iodide

Itensifiers and Reducers

1. Chromium Intensifiers
   - potassium dichromate
2. Mercury Intensifiers
   - potassium bromide
   - mercuric chloride
   - sodium cyanide
   - silver nitrate

PHOTOGRAPHIC PRODUCTS (Cont'd)

Intensifiers and Reducers (Cont'd)

- potassium dichromate
- sodium bisulphite
- sodium thiosulphate

3. Silver Intensifiers
   - silver nitrate
   - sodium sulphite
   - sodium thiosulphite
   - lead nitrate
   - potassium permanganate
4. Farmer's Reducers
   - potassium ferricyanide
   - sodium thiosulphate
5. Flattening Reducers
   - potassium ferricyanide
   - potassium bromide
   - ammonium hydroxide
   - potassium bromide
6. Persulphate Reducers
   - ammonium persulphate
7. Harmonizing-Bleaching Reducer
   - potassium dichromate
   - potassium permanganate
   - potassium citrate
   - ferric ammonium sulphate
   - sodium sulphite
   - ferric chloride

Stain Remover

- potassium permanganate
- sodium chloride

Toners

1. Gold
   - sodium thiosulphate

PHOTOGRAPHIC PRODUCTS (Cont'd)

Toners (Cont'd)

- potassium persulphate
- silver nitrate
- sodium chloride
- gold chloride

2. Iron
   - ferric ammonium citrate
   - potassium ferricyanide
3. Polysulphide
   - sodium carbonate
4. Sulphide Sepia Toners
   - potassium ferricyanide
   - potassium bromide
   - potassium oxalate
   - ammonium hydroxide
   - sodium sulphide
5. Varigam Toners
   - potassium ferricyanide
   - potassium bromide
   - potassium iodide
   - sodium chloride
   - sodium carbonate
   - potassium carbonate
   - potassium thiocyanate
6. Hypo Alum Sepia
   - sodium thiosulphate
   - potassium alum
   - silver nitrate
   - sodium chloride

Tray Cleaner

- potassium dichromate
- potassium permanganate
- sodium bisulphite
- sodium sulphate

(21) PIGMENTS

Black

- ferric oxide
- copper
- chrome
- manganese
- iron oxides
- manganese oxides
- manganese dioxide

Blue

- lead sulphate
- barium lake
- cobaltous stannate
- cobaltous aluminate
- cupric sulphide
- copper calcium silicate
- ferric ferocyanide
- potassium silicate
- aluminum silicate
- copper phthalocyanine

Green

- cadmium salts
- cobalt salts
- cobalt sulphide
- chromium oxides
- chromates
- lead
- ferrocyanide
- cupric acetoarsenite
- hydrated chromium sesquioxide
- hydrous iron, magnesium, aluminum, potassium silicates
- hydrated chromium sesquioxide
- copper debasic acetate

PIGMENTS (Cont'd)

Orange

- antimony sulphide
- cadmium sulphide
- cadmium sulfoselenide
- barium sulphate
- cadmium
- barium sulphate
- zinc sulphide
- lead chromate
- ferric oxide
- lead sulphate
- lead molybdate
- lead tetroxide
- selenium

Red

- calcium, barium, manganese salts of B-hydroxy
- napthoic acid azodyes
- ferric oxide
- silica oxide
- aluminum oxide
- cadmium sulfoselenide
- cadmium selenide
- mercuric sulphide
- cupric oxide
- silica
- alumina
- lime
- magnesia
- aluminum silicate
- lead oxide

Violet

- cobalt phosphate
- manganese ammonium pyrophosphate

PIGMENTS (Cont'd)

White

- aluminum hydroxide
- aluminum silicate
- antimonyoxide
- calcium sulphate
- barium magnesium carbonate
- barium sulphate
- calcium carbonate
- calcium silicate
- zinc oxide
- lead carbonate
- silica, silicon dioxide
- lead titanium oxide
- lead sulphate
- magnesium carbonate
- magnesium oxide
- hydrated magnesium silicate
- zinc sulphide

Yellow and Brown

- lead antimoniate
- zinc oxide
- bismuth oxide
- potassium cobaltinitrite
- cadmium salts
- barium chromate
- ferric oxide
- cadmium sulphide
- lead oxychloride
- lead sulfochromate
- lead chromate
- lead oxide
- manganese hydroxide
- stannic sulphide

PIGMENTS (Cont'd)

Yellow and Brown (Cont'd)

- arsenic trisulphide
- ferric oxide
- strontium chromate
- nickel, antimony, titanium oxide complex
- mercuric oxide
- zinc chromate

Other Pigments

1. Metallic
   - aluminum
   - copper
   - zinc
   - tin
   - iron
   - lead
   - nickel
   - silver
2. Luminous
   - calcium-strontium sulphide
   - zinc sulphide

(22) POLISH

General Purpose Polish

- zinc stearate

Metal Polishes

- ammonium hydroxide

Paste Wax

- aluminum, barium or calcium soaps

Porcelain, Metal Polishes

- ammonium hydroxide

Shoe Polish

- zinc oxide

POLISH (Cont'd)

Silver Polish

- silver nitrate
- sodium thiosulphate
- titanium dioxide

(23) POWDERS

Food Powder

- zinc undecyclenate
- zinc stearate
- aluminum potassium sulphate
- aluminum acetate
- aluminum chlorhydroxide
- aluminum chloride
- aluminum silicate
- potassium alum
- copper, sodium and zinc salts

Douche Powder

- aluminum sulphate
- potassium sulphate
- zinc sulphate
- zinc phenosulfonate
- magnesium sulphate
- potassium alum
- sodium caprylate

Dusting Powder

- zinc stearate
- iron oxide

Medicated Powder

- zinc oxide

(24) PRESERVATIVES

Brush

- ammonium alum

PRESERVATIVES (Cont'd)

Canvas

- copper naphthenate

Floor

- magnesium fluorsilicate
- sodium zinc silicate
- sulphates

Wood

- copper hydrate
- copper naphthenate
- zinc naphthenate
- copper linoleate
- copper oleate
- copper - 8 - quinolinolate
- iron oxide
- silicate

(25) SANITIZERS

Swimming Pool

- sodium hypochlorite
- sodium carbonate
- sodium tripolyphosphate
- trisodium phosphate
- potassium iodide

(26) SOAPS

General Purpose Soaps

- sodium silicate
- sodium carbonate
- sodium phosphate
- sodium perborate

Hand Cleaners, Powdered

- sodium phosphate
- sodium carbonate

SOAPS (Cont'd)

Light Duty Soaps

- sodium silicate
- sodium carbonate
- potassium carbonate

Toilet Bar Soaps

- sodium silicate
- titanium dioxide
- sodium sulphate

(27) SUPPOSITORIES

- zinc oxide
- bismuth subgallate
- zinc phenolsulfonate
- bismuth subiodide
- bismuth subcarbonate

(28) WATER TREATING CHEMICALS

- sodium aluminum silicates
- manganese zeolite
- sodium sulphate
- copper sulphate
- potassium permanganate
- sodium hexameta phosphate
- potassium iodide
- zinc sulphate
- manganese sulphate
- iron sulphate

(29) MEDICINE

Gastric Antacid

- magnesium trisilicate
- magnesium carbonate
- dried aluminum hydroxide gel
- lithium carbonate
- magnesium oxide

MEDICINE (Cont'd)

Gastric Antacid (Cont'd)

- bismuth subcarbonate
- calcium carbonate
- cupric phenol sulfonate
- bismuth subgallate
- bismuth subnitrate
- bismuth subsalicylate
- zinc phenolsulfonate

Arthritis, Rheumatic

- sodium bicarbonate
- aluminum hydroxide gel
- sodium salicylate
- potassium iodide
- strontium salicylate
- magnesium salicylate

Cough Syrup

- potassium guaiacol sulfonate
- antimony potassium tartrate
- ammonium chloride
- antimony tartrate
- potassium iodide

Analgesic

- magnesium carbonate
- potassium citrate
- zirconium oxide
- aluminum hydroxide
- potassium bromide
- aluminum aspirin
- magnesium hydroxide

Hemorrhoids

- potassium alum sulphate
- iron citrate

MEDICINE (Cont'd)

Hemorrhoids (Cont'd)

- zinc sulphate
- copper sulphate
- bismuth subnitrate

Enemas

- cobalt chloride
- copper sulphate
- ferrous sulphate

Antacid

- aluminum hydroxide
- magnesium hydroxide
- magnesium carbonate
- bismuth subcarbonate
- sodium bicarbonate
- magnesium trisilicate
- sodium chloride

Sedative

- ammonium bromide
- potassium bromide
- sodium bromide
- strontium bromide
- antimony tartrate
- potassium tartrate
- arsenic trioxide
- ferrous sulphate
- ammonium chloride

Bronchial Asthma

- aluminum hydroxide gel
- potassium iodide

4.2.2 Unit B - Metal Index

Metals

(1)	Aluminum	(21)	Manganese
(2)	Ammonium	(22)	Mercury
(3)	Antimony	(23)	Molybdenum
(4)	Arsenic	(24)	Nickel
(5)	Barium	(25)	Nitrate
(6)	Bismuth	(26)	Nitrite
(7)	Boron	(27)	Phosphate
(8)	Bromine	(28)	Potassium
(9)	Cadmium	(29)	Selenium
(10)	Calcium	(30)	Silicon
(11)	Carbonate	(31)	Silver
(12)	Chloride	(32)	Sodium
(13)	Chromium	(33)	Strontium
(14)	Cobalt	(34)	Sulphate
(15)	Copper	(35)	Tin
(16)	Fluoride	(36)	Titanium
(17)	Iron	(37)	Vanadium
(18)	Lead	(38)	Zinc
(19)	Lithium	(39)	Zirconium
(20)	Magnesium		

(1) ALUMINUM

Product	COMPOUND	PRODUCT DIVISION
leather or rubber dressing (coating)	aluminum stearate	auto. products
radiator stop leak	aluminum oxide	auto. products
chassis lubricants	aluminum soap	auto. products
generator powder	aluminum sulphate	auto. products
caulking compounds	aluminum stearates	caulking compounds
silicone rubber caulking	aluminum flake	caulking compounds
drain pipe powder	aluminum particles	cleaners

ALUMINUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
sewer, cesspool, septic tank cleaners	aluminum particles	cleaners
barrier creams (protective)	aluminum compounds	cosmetics
bleach and freckle creams and ointments	aluminum oxide particles	cosmetics
conditioning (skin) creams	aluminum chlorhydroxide	cosmetics
toothpaste	alumina hydrate	cosmetics
cream antiperspirants	aluminum chlorhydroxide	cosmetics
deodorant cream	aluminum chloride aluminum sulphate aluminum phenosulfonate	cosmetics
liquid antiperspirant	aluminum chloride	cosmetics
roll-on deodorant	aluminum chlorhydroxide aluminum chloride	cosmetics
spray deodorant	aluminum chloride aluminum phenolsulfonate	cosmetics
deodorant jell	aluminum subacetate	cosmetics
eyebrow pencils	aluminum silicates	cosmetics
eye shadow	aluminum powder	cosmetics
liquid powders	magnesium aluminum magnesium silicate	cosmetics
shaving lotion	aluminum chlorhydroxy allantoinate aluminum phenolsulfonate	cosmetics
styptic pencil	potassium aluminum sulphate	cosmetics
astringent	aluminum chlorhydroxide	cosmetics
astringent	aluminum acetate	cosmetics
skin fresheners	aluminum chlorhydroxide aluminum acetate	cosmetics
joint compound filler	aluminum silicate aluminum oxide	fillers
foam fire extinguishers	aluminum sulphate	fire exting.
powder extinguishers	aluminum stearates	fire exting.
pesticides	sodium aluminum fluoride	house and garden pesticides
pigmented inks	aluminum powder	inks

ALUMINUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
skin ointment	aluminum acetate aluminum sulphate	ointment
traffic paint	aluminum stearate	paints
gloss enamel and floor enamels	aluminum silicate aluminum iron	paints
aluminum roof paint	aluminum powder	paints
heat resistant paint	aluminum	paints
barn paints	aluminum silicate	paints
hardeners	aluminum chloride aluminum sulphate aluminum acetate	photo products
fixing baths	potassium aluminum acetate	photo products
blue pigment	aluminum silicate	pigment
green pigment	hydrous aluminum silicates	pigment
red pigment	aluminum oxide alumina aluminum silicate	pigment
white pigment	aluminum hydroxide aluminum silicate	pigment
metallic pigments	aluminum	pigment
paste wax	aluminum soaps	polish
foot powder	aluminum potassium sulphate aluminum acetate aluminum chlorhydroxide aluminum chloride aluminum silicate	powder
douche powder	aluminum sulphate	powder
water treating chemicals	sodium aluminum silicates	water treating chemicals
gastric antacid	red aluminum hydroxide gel	medicine
arthritis, rheumatic analgesic	aluminum hydroxide gel aluminum hydroxide aluminum aspirin	medicine medicine
antacid	aluminum hydroxide	medicine
bronchial asthma	aluminum hydroxide gel	medicine

(2) AMMONIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
carburetor cleaners	ammonium oxalate	auto products
chrome cleaners	ammonium hydroxide ammonium oxalate	cleaners
liquid detergents	ammonium sulphate	cleaners
furnace and fireplace	ammonium chloride	cleaners
glass (window) cleaners	ammonium hydroxide	cleaners
metal cleaners	ammonium citrate	cleaners
monument cleaners	ammonium bifluoride	cleaners
paint and varnish cleaners	ammonia ammonium chloride	cleaners
stain, spot, lipstick, rust remover	ammonium hydroxide	cleaners
wall cleaners	ammonium hydroxide	cleaners
wallpaper cleaner	ammonium alum	cleaners
barrier creams (protective)	ammonium hydroxide	cosmetics
toothpaste	ammonium phosphate	cosmetics
dyes, tints (hair)	ammonia	cosmetics
hair straighteners	ammonium thioglycolate ammonium hydroxide	cosmetics
mouthwash	ammonium phosphate	cosmetics
liquid rouge	ammonium hydroxide	cosmetics
liquid paste rouge	ammonium hydroxide	cosmetics
shaving cream (lather type)	ammonium stearate	cosmetics
cleanser type deodorizer	ammonium chloride ammonium hydroxide	deodorizer
powder extinguisher	ammonium monophosphate	fire exting.
skin ointment	ammonium chloride	ointments
anti-corrosion paints	ammonium hydroxide	paints
fixing baths	ammonium chloride	photo products
flattening reducers	ammonium hydroxide	photo products
persulphate reducer	ammonium persulphate	photo products
harmonizing-bleaching reducer	ferric ammonium sulphate	photo products

AMMONIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
sulphide sepia toners	ammonium hydroxide	photo products
violet pigment	manganese ammonium pyrophosphate	photo products
metal polish	ammonium hydroxide	polish
porcelain polish	ammonium hydroxide	polish
brush preservatives	ammonium alum	preservatives
cough syrup	ammonium chloride	medicine
sedative	ammonium bromide ammonium chloride	medicine

(3) ANTIMONY

PRODUCT	COMPOUND	PRODUCT DIVISION
orange pigment	antimony sulphide	pigments
white pigment	antimony oxide	pigments
yellow and brown pigment	antimony oxide	pigments
cough syrup	antimony tartrate	medicine
sedative	antimony tartrate	medicine

(4) ARSENIC

PRODUCT	COMPOUND	PRODUCT DIVISION
antifreeze	arsenic compounds	auto product
ant pesticide	arsenic arsenic trioxide	house and garden pesticides
flower garden pesticide	arsenic	house and garden pesticides
garden pesticide	arsenic	house and garden pesticides
lawn pesticide	lead arsenate	house and garden pesticides
roach killer	lead arsenate	house and garden pesticides
termite killer	arsenic trioxide	house and garden pesticides

(4) ARSENIC (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
mouse killer	arsenic trixoide	house and garden pesticides
anti-algae paints	arsenic oxide arsenic compounds	paints
anti-corrosion paint	arsenic	paints
yellow & brown pigment	arsenic trisulphide	pigments
sedative	arsenic trioxide	medicine

(5) BARIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
automatic transmission fluid	barium petroleum sulphonate barium alkyl phenolates	auto products
polysulfide caulking compound	barium oxide barium peroxide	caulking compound
cream dipilatory	barium sulphide	cosmetics
face powder	barium sulphate	cosmetics
shaving powder	barium sulphide	cosmetics
motor fuel additive	barium soaps of oxidate	fuels
greases	barium compounds	lubricants
gear oils	barium petroleum sulfonates barium phenolates	oils
miscellaneous oils	barium	oils
motor oils	barium petroleum sulfonate	oils
anti-algae paints	barium metaborate monohydrate	paints
latex wall paint, texture coatings, filler	barium metaborate	paints
floor paint	barium sulphate	paints
blue pigment	barium lake	pigments
orange pigment	barium sulphate	pigments
red pigment	barium salts of B-hydroxy	pigments

BARIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
white pigment	barium magnesium carbonate	pigments
yellow and brown pigment	barium chromate	pigments
paste wax	barium soaps	polish

(6) BISMUTH

PRODUCT	COMPOUND	PRODUCT DIVISION
bleach and freckle creams and ointments	bismuth subnitrate	cosmetics
freckle lotion	bismuth subnitrate	cosmetics
dyes, tints - hair - preparations	bismuth acetate	cosmetics
lipsticks	bismuth oxychloride	cosmetics
skin fresheners	bismuth subnitrate	cosmetics
skin ointment	bismuth subnitrate	ointments
yellow and brown pigment	bismuth oxide	pigments
suppositories	bismuth subgallate bismuth subiodide bismuth subcarbonate	suppositories
gastric antacid	bismuth subnitrate bismuth subsalicylate bismuth subgallate	medicine
hemorrhoids	bismuth subnitrate	
antacid	bismuth subcarbonate	medicine

(7) BORON

PRODUCT	COMPOUND	PRODUCT DIVISION
soil nutrient	boron	house and garden pesticides

(8) BROMINE

PRODUCT	COMPOUND	PRODUCT DIVISION
permanent waves, hair preparations	sodium bromate potassium bromate	cosmetics
motor fuel additive	ethylene dibromide	fuels
mercury intensifiers	potassium bromide	photo products

(8) BROMINE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
flattening reducers	potassium bromide	photo products
varigam toners	potassium bromide	photo products
sedative	potassium bromide sodium bromide strontium bromide	medicine

(9) CADMIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
dyes, tints - hair	cadmium chloride	cosmetics
shampoo	cadmium lauryl cadmium lauryl sulphate cadmium stearate	cosmetics
lawn pesticides	cadmium compounds cadmium succinate	house and garden pesticides
green pigment	cadmium salts	pigments
orange pigment	cadmium sulphide cadmium sulfoselenide cadmium selenium	pigments
red pigment	cadmium sulfoselenide cadmium selenide	pigments
yellow and brown pigment	cadmium salts cadmium sulphide	pigments

(10) CALCIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
antifreeze	calcium chloride	auto products
automatic transmission fluid	calcium petroleum sulfonates calcium alkyl phenolates	auto products
tire paint (white)	calcium carbonate	auto products
foam suppressors	calcium acetate calcium ricinoleate	auto products
caulking compounds	calcium stearates calcium carbonate	caulking compds.
denture cleaners	calcium chloride calcium phosphate	cleaners

CALCIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
metal cleaners	calcium chloride	cleaners
toothpaste	dicalcium phosphate tricalcium phosphate calcium carbonate calcium pyrophosphate calcium sulphate	cosmetics
depilatory cream	calcium thioglycolate calcium carbonate calcium hydroxide	cosmetics
eye shadow	calcium carbonate	cosmetics
liquid powders	calcium carbonate magnesium calcium carbonate	cosmetics
body powder	calcium carbonate	cosmetics
face powder	calcium carbonate	cosmetics
dairy disinfectant	calcium hypochlorite	disinfectants
alkali disinfectant	calcium hydroxide	disinfectants
liquid disinfectant	calcium hypochlorite	disinfectants
air drier	calcium chloride	driers
ant pesticide	calcium cyanide	house and garden pesticides
flower and garden pesticides	calcium arsenate	house and garden pesticides
garden pesticide	tricalcium arsenate	house and garden pesticides
gear oils	calcium petroleum sulfonate calcium phenolates	oils
motor oils	calcium petroleum sulfonate	oils
traffic paint	calcium carbonate	paints
flat wall paint oil, primers and sealers	titanium calcium	paints
gloss enamel and floor enamels	titanium calcium	paints
house paint, trim paint	calcium sulphate	paints
exterior oil, exterior primers	calcium carbonate	paints

CALCIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
semigloss, satin or eggshell enamel	calcium carbonate	paints
floor paint	titanium calcium	paints
blue pigment	calcium silicate	pigments
red pigment	calcium salts of B-hydroxy	pigments
white pigment	calcium sulphate calcium carbonate calcium silicate	pigments
luminous pigment	calcium strontium sulphide	pigments
paste wax	calcium soaps	polish
gastric acid	calcium carbonate	medicine

(11) CARBONATE

PRODUCT	COMPOUND	PRODUCT DIVISION
corrosion inhibitors	sodium carbonate	auto. products
laundry bleaches, liquid	sodium carbonate	bleaches
household bleach, liquid	sodium carbonate	bleaches
caulking compound	calcium carbonate	caulking compd.
abrasive cleaner	sodium carbonate	cleaners
aluminum cleaners	sodium bicarbonate sodium carbonate	cleaners
boiler cleaners	sodium carbonate	cleaners
boiler treatments	sodium carbonate	cleaners
coffee pot cleaners	sodium bicarbonate	cleaners
dairy cleaners	sodium bicarbonate sodium carbonate	cleaners
detergents - automatic dishwasher	sodium carbonate	cleaners
detergents - granulated and tablet	sodium carbonate	cleaners
disinfectant cleaners	sodium carbonate	cleaners
drain and pipe powder	sodium carbonate	cleaners
egg cleanser	sodium carbonate	cleaners

(11) CARBONATE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
furnace and fireplace	magnesium carbonate	cleaners
general cleaner	sodium carbonate sodium sesqui carbonate	cleaners
saddle soap	potassium carbonate	cleaners
metal cleaners	sodium carbonate	cleaners
paint and varnish cleaners	sodium carbonate	cleaners
paint and varnish removers	sodium sesqui carbonate	cleaners
rug and upholstery cleaners	sodium carbonate sodium bicarbonate	cleaners
sewer, cesspool, septic tank cleaners	sodium carbonate	cleaners
baby preparation powder	magnesium carbonate	cosmetics
bath salts	sodium bicarbonate	cosmetics
freckle lotions	potassium carbonate	cosmetics
toothpaste	calcium carbonate magnesium carbonate sodium bicarbonate	cosmetics
depilatory cream	calcium carbonate	cosmetics
eye shadow	calcium carbonate	cosmetics
face make-up packs	magnesium carbonate	cosmetics
liquid powders	calcium carbonate magnesium carbonate magnesium calcium carbonate	cosmetics
mouthwashes	sodium bicarbonate	cosmetics
cuticle softener	sodium carbonate	cosmetics
body powder	calcium carbonate	cosmetics
face powder	calcium carbonate magnesium carbonate	cosmetics
hand lotion	zinc carbonate	cosmetics
alkali disinfectant	sodium carbonate	disinfectants
ammonium disinfectant	sodium carbonate	disinfectants
foam fire extinguisher	sodium bicarbonate	fire exting.
powder extinguisher	sodium bicarbonate potassium bicarbonate	fire exting.
ant pesticide	sodium carbonate	house and garden pesticides

CARBONATE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
laundry bluing	sodium bicarbonate	laundry prod.
house paint, trim paint, exterior oil, exterior primer	calcium carbonate	paints
semi-gloss, satin or eggshell enamel	calcium carbonate	paints
developers	sodium carbonate	photo products
hardeners	sodium carbonate	photo products
varigam toners	sodium carbonate potassium carbonate	photo products
white pigment	barium magnesium carbonate calcium carbonate magnesium carbonate	pigments
swimming pool sanitizer	sodium carbonate	sanitizers
general purpose soap	sodium carbonate	soaps
hand cleaners, powdered	sodium carbonate	soaps
light duty soap	sodium carbonate potassium carbonate	soaps
suppository	bismuth subcarbonate	suppositories
gastric antacid	magnesium carbonate lithium carbonate calcium carbonate	medicine
arthritis, rheumatic	sodium bicarbonate	medicine
analgesic	magnesium carbonate	medicine
antacid	magnesium carbonate	medicine

(12) CHLORIDE

PRODUCT	COMPOUND	PRODUCT DIVISION
laundry bleach, liquid	sodium chloride	bleaches
household bleach, liquid	sodium chloride	bleaches
toilet bowl cleaners	sodium chloride	cleaners
denture cleaners	sodium chloride	cleaners
detergents - automatic dishwasher	sodium hypochlorite	cleaners
detergents - granulated and tablet	sodium chloride	cleaners

(12) CHLORIDE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
drain and pipe powder	sodium chloride	cleaners
furnace and fireplace	sodium chloride ammonium chloride copper chloride	cleaners
metal cleaners	calcium chloride	cleaners
paint and varnish cleaners	ammonium chloride	cleaners
rug and upholstery cleaners	sodium chloride	cleaners
sewer, cesspool, septic tank cleaners	sodium chloride	cleaners
stainless steel cleaners	sodium chloride	cleaners
stain, spot, lipstick, rust remover	sodium hypochlorite	cleaners
bath salts	sodium chloride	cosmetics
bubble bath	sodium chloride	cosmetics
bleach and freckle creams	mercuric chloride	cosmetics
ointments	mercurous chloride	cosmetics
deodorant cream	aluminum chloride	cosmetics
liquid antiperspirant	aluminum chloride	cosmetics
roll-on deodorant	aluminum chloride	cosmetics
spray deodorant	aluminum chloride	cosmetics
dyes, tints - hair preparations	cadmium chloride cobalt chloride cupric chloride ferric chloride	cosmetics
mouthwash	sodium chloride zinc chloride	cosmetics
lipsticks	bismuth oxychloride	cosmetics
cleanser deodorizer	ammonium chloride sodium chloride	deodorizer
dairy disinfectant	sodium chloride	disinfectants
liquid disinfectant	sodium chloride	disinfectants
air driers	calcium chloride aluminum chloride potassium chloride	driers
rug dye	sodium chloride	dyes

CHLORIDE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
motor fuel additive	ethylene dichloride	fuels
ant pesticide	sodium chloride	house and garden pesticides
flower garden pesticides	copper oxychloride	pesticides
lawn pesticides	mercurous chloride	pesticides
roach killer	mercuric chloride sodium chloride	pesticides
skin ointment	mercury bichloride ammonium chloride	ointments
opthalmic ointment	potassium chloride	ointments
fixing baths	ammonium chloride	photo products
hardeners	ammonium chloride aluminum chloride stannic chloride	photo products
mercuric intensifiers	mercuric chloride	photo products
harmonizing - bleaching reducer	ferric chloride	photo products
stain remover	sodium chloride	photo products
gold toner	sodium chloride	photo products
varigam toners	sodium chloride	photo products
hypoalum sepia toner	sodium chloride	photo products
foot powder	aluminum chloride	powders
enemas	cobalt chloride	medicine
antacid	sodium chloride	medicine
sedative	ammonium chloride	medicine

(13) CHROMIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
rust inhibitor antifreeze	chromates	auto. products
carburetor cleaners	sodium chromate	auto. products
corrosion inhibitors	sodium chromate potassium bichromate	auto. products
radiator cleaners (alkaline)	sodium dichromate	auto. products
(mixed)	sodium chromate potassium dichromate	

CHROMIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
caulking compounds	chromium	caulking compounds
boiler cleaners	potassium dichromate	cleaners
boiler treatments	sodium dichromate	cleaners
metal cleaners	chromic acid	cleaners
liquid fire extinguisher	sodium dichromate	fire exting.
flower garden pesticides	copper zinc chromate	house and garden pesticides
lawn pesticide	potassium chromate	house and garden pesticides
greases	chromate	lubricants
anti-corrosion paints	zinc chromate lead chromate	paints
traffic paint	lead chromate	paints
heat resistant paint	chrome	paints
metal primer	zinc chromate	paints
chromium intensifiers, reducers	potassium dichromate	photo products
mercury intensifiers	potassium dichromate	photo products
harmonizing - bleaching reducer	potassium dichromate	photo products
black pigment	chrome	pigments
green pigment	chromium oxides chromates hydrated chromium sesquioxide	pigments
orange pigment	lead chromate	pigments
yellow and brown	barium chromate lead chromate lead sulfochromate strontium chromate	pigments

(14) COBALT

PRODUCT	COMPOUND	PRODUCT DIVISION
leather or rubber dressing (coating)	cobalt	auto products
caulking compounds	cobalt drier	caulking compd.
hair prep. - dyes tints	cobalt chloride	cosmetics

COBALT (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
ophthalmic ointment	cobalt sulphate	ointments
driers	cobalt compounds	paints
blue pigment	cabaltous stannate cobaltous aluminate	pigments
green pigment	cobalt salts cobalt sulphides	pigments
violet pigment	cobalt phosphate	pigments
enemas	cobalt chloride	medicine

(15) COPPER

PRODUCT	COMPOUND	PRODUCT DIVISION
furnace and fireplace	copper sulphate copper 6% liquid linoresinate copper chloride	cleaners
sewer, cesspool, septic tank cleaners	copper sulphate	cleaners
dyes, tints - hair prep.	cupric chloride copper sulphate	cosmetics
motor fuel additive	copper naphthenate	fuels
flower garden pesticides	copper copper oxychloride copper zinc chromates	house and garden pesticides
garden pesticides	copper copper-zinc sulphates	house and garden pesticides
termite killer	copper resinate	house and garden pesticides
tomato dust	copper sulphate	house and garden pesticides
soil nutrient	copper	house and garden pesticides
pigmented inks	copper salts	inks
skin ointment	copper sulphate	ointments
fungicidal ointment	copper capryolate	ointments
antialgae paints	cuprous oxide copper sulphate pentahydrate	paints

COPPER (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
anticorrosion paint	cuprous oxide	paints
heat resistant paint	copper	paints
barn paint	cuprous oxide	paints
black pigment	copper sulphide	pigments
blue pigment	cupric sulphide copper silicate copper phthalocyanine	pigments
green pigment	cupric acetoarsenite copper diabasic acetate	pigments
red pigment	cupric oxide	pigments
metallic pigment	copper	pigments
foot powder	copper salts	powders
canvas preservative	copper naphthenate	preservatives
wood preservative	copper hydrate copper naphthenate copper linoleate copper oleate copper-8-quinolinolate	preservatives
water treating chemicals	copper sulphate	water treating chemicals
gastric antacid	cupric phenolsulfonate	medicine
hemorrhoids	copper sulphate	medicine
enemas	copper sulphate	medicine

(16) FLUORIDE

PRODUCT	COMPOUND	PRODUCT DIVISION
aluminum cleaners	magnesium silicofluoride sodium fluoride	cleaners
boiler cleaners	sodium fluoride	cleaners
metal cleaners	magnesium silicofluoride	cleaners
monument cleaners	ammonium bifluoride sodium bifluoride	cleaners
tooth powder	stannous fluoride sodium fluoride	cosmetics
ant pesticide	sodium fluoride sodium silicofluoride	house and garden pesticides
garden pesticide	sodium aluminum fluoride	house and garden pesticides

FLUORIDE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
roach killer	sodium fluoride sodium silicofluoride	house and garden pesticides
moth spray	zinc silicofluoride	house and garden pesticides

(17) IRON

PRODUCT	COMPOUND	PRODUCT DIVISION
undercoatings	iron oxide	auto. products
caulking compounds	iron oxide	caulking compds.
furnace and fireplace	red iron oxide	cleaners
eyebrow pencil	iron oxide	cosmetics
mascara	iron oxide	cosmetics
dyes, tints - hair prep.	ferric chloride ferrous sulphate	cosmetics
face powder	iron oxide	cosmetics
foam fire extinguishers	iron salts	fire exting.
ant pesticide	iron oxide	house and garden pesticides
lawn pesticide	ferrous sulphate	house and garden pesticides
soil nutrient	iron	house and garden pesticides
driers	iron compounds	paints
gloss enamel and floor enamel	aluminum iron red iron oxide	paints paints
heat resistant paint	iron	paints
stain	ferric oxide	paints
metal primer	red iron oxide	paints
barn paints	red iron oxide	paints
harmonizing-bleaching reducer	ferric ammonium sulphate ferric chloride	photo products
iron toner	ferric ammonium citrate	photo products
black pigment	ferric oxide iron oxide	pigments
blue pigment	ferric ferrocyanide	pigments

IRON (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
green pigment	hydrous iron silicates	pigments
orange pigment	ferric oxide	pigments
red pigment	ferric oxide	pigments
yellow and brown	ferric oxide	pigments
metallic pigment	iron	pigments
dusting powder	iron oxide	powders
wood preservative	iron oxide	preservatives
water treating chemicals	iron sulphate	water treating chemicals
hemorrhoids	iron citrate	medicine
enemas	ferrous sulphate	medicine
sedative	ferrous sulphate	medicine

(18) LEAD

PRODUCT	COMPOUND	PRODUCT DIVISION
leather or rubber coating	lead	auto. products
undercoatings	lead or lead salts	auto. products
caulking compounds	lead	caulking compds.
dyes, tints - hair prep.	lead acetate	cosmetics
motor fuels	tetraethyl lead tetramethyl lead	fuels
motor fuel additive	tetraethyl lead	fuels
ant pesticide	lead arsenate	house and garden pesticides
garden pesticide	lead arsenate	house and garden pesticides
lawn pesticide	lead arsenate	house and garden pesticides
roach killer	lead arsenate	house and garden pesticides
greases	lead compounds	lubricants
gear oils	lead soaps lead naphthenate	oils
traffic paint	lead chromate lead molybdate lead sulphate	paints

LEAD (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
anticorrosion paint	lead chromate red lead oxide basic lead carbonate lead monoxide	paints
driers	lead naphthenate lead octoate lead tallate	paints
lacquers	lead acetate	paints
flat wall paint oil, primers and sealers	lead	paints
house paint, trim paint exterior oil, exterior primers	white lead	paints
stain	lead	paints
metal primer	red lead	paints
patio paints	lead	paints
barn paints	lead oxide	paints
silver intensifier	lead nitrate	photo products
blue pigment	lead sulphate	pigments
green pigment	lead	pigments
orange pigment	lead chromate lead sulphate lead molybdate lead tetroxide	pigments
red pigment	lead oxide	pigments
white pigment	lead oxide lead titanium lead dioxide lead sulphate	pigments
yellow and brown pigment	lead antimoniate lead oxychloride lead sulfochromate lead chromate lead oxide	pigments
metallic pigment	lead	pigments

(19) LITHIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
eye shadow	lithium stearate	cosmetics
gastric antacid	lithium carbonate	medicine

(20) MAGNESIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
aluminum cleaners	magnesium silicofluoride	cleaners
denture cleaners	magnesium sulphate	cleaners
furnace and fireplace	magnesium carbonate	cleaners
metal cleaners	magnesium silicofluoride	cleaners
baby preparation powder	magnesium carbonate	cosmetics
barrier creams (protective)	magnesium stearate	cosmetics
toothpaste	magnesium carbonate magnesium oxide magnesium phosphate	cosmetics
deodorant cream	magnesium oxide	cosmetics
spray deodorant	magnesium oxide	cosmetics
face make-up (packs)	magnesium carbonate	cosmetics
liquid make-up	magnesium carbonate magnesium oleate magnesium calcium carbonate	cosmetics
face powder	magnesium carbonate magnesium stearate	cosmetics
shampoo	magnesium sulphide magnesium lauryl sulphate magnesium stearate	cosmetics
cleanser deodorant	magnesium sulphite	deodorizers
foam fire extinguisher	magnesium stearate	fire extinguishers
powder extinguisher	magnesium stearate	fire extinguishers
anti-algae paints	magnesium silicate	paints
traffic paint	magnesium silicate	paints
lacquers	magnesium oxide	paints
flat wall paint oil	titanium magnesium	paints
primers and sealers	magnesium silicates	paints
house paint, trim paint	magnesium silicate	paints
exterior oil	titanium magnesium	paints
floor paint	magnesium carbonate	paints
metal primer	magnesium silicate	paints
barn paint	magnesium silicate	paints

MAGNESIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
green pigments	hydrous magnesium silicate	pigments
red pigment	magnesia	pigments
white pigment	barium magnesium carbonate magnesium carbonate magnesium oxide hydrated magnesium silicate	pigments
douche powder	magnesium sulphate	powders
floor preservative	magnesium fluorosilicate	preservatives
gastric antacid	mangesium trisilicate magnesium carbonate magnesium oxide	medicine
arthritis, rheumatic	magnesium salicylate	medicine
analgesic	magnesium carbonate magnesium hydroxide	medicine
antacid	magnesium hydroxide magnesium carbonate magnesium trisilicate	medicine

(21) MANGANESE

PRODUCT	COMPOUND	PRODUCT DIVISION
dyes, tints - hair prep.	manganese sulphate	cosmetics
soil nutrient	manganese	house and garden pesticides
driers	manganese compounds	paints
black pigment	manganese manganese oxide manganese dioxide	pigments
red pigment	manganese salts of B-hydroxy	pigments
violet pigment	manganese ammonium pyrophosphate	pigments
yellow and brown pigment	manganese hydroxide	pigments
water treating chemicals	manganese zeolite manganese sulphate	water treating chemicals

(22) MERCURY

PRODUCT	COMPOUND	PRODUCT DIVISION
bleach, freckle creams and ointments	ammoniated mercury mercuric chloride mercuric oxide	cosmetics
freckle lotions	ammoniated mercury	cosmetics
conditioning (skin) cream	ammoniated mercury	cosmetics
face wax	mercurized wax	cosmetics
skin freshener	ammoniated mercury	cosmetics
misc. disinfectants	mercury compounds	disinfectants
lawn pesticides	mercurous chloride organic mercury compounds	house and garden pesticides
roach killer	mercuric chloride	house and garden pesticides
skin ointment	ammoniated mercury mercury bichloride	ointments
ophthalmic ointment	mercuric oxide ammoniated mercury	ointments
fungicidal ointment	mercury salicylate	ointments
anti-algae paints	mercury soap mercuric oxide phenyl mercury oleate	paints
flat wall paint oil, primers and sealers	mercury	paints
hypotest solution	mercuric chloride	photo products
mercury intensifiers	mercuric chloride	photo products
red pigment	mercuric sulphide	pigments
yellow and brown pigment	mercuric oxide	pigments

(23) MOLYBDENUM

PRODUCT	COMPOUND	PRODUCT DIVISION
chassis lubricants	molybdenum	auto. products
soil nutrient	molybdenum	house and garden pesticides
greases	molybdenum disulphide	lubricants

(24) NICKEL

PRODUCT	COMPOUND	PRODUCT DIVISION
dyes, tints - hair prep.	nickel	cosmetics
yellow and brown pigment	nickel oxide	pigments
metallic pigment	nickel	pigments

(25) NITRATE

PRODUCT	COMPOUND	PRODUCT DIVISION
corrosion inhibitors	sodium nitrate	auto. products
toilet bowl cleaners	sodium nitrate	cleaners
liquid detergents	sodium nitrate	cleaners
furnace and fireplace	potassium nitrate	cleaners
bleach, freckle creams and ointments	bismuth subnitrate	cosmetics
dyes, tints - hair prep.	silver nitrate	cosmetics
hypotest solution	silver nitrate	photo. products
mercury intensifiers	silver nitrate	photo. products
silver intensifiers	silver nitrate lead nitrate	photo. products
gold toner	silver nitrate	photo. products
hypoalum sepia	silver nitrate	photo. products

(26) NITRITE

PRODUCT	COMPOUND	PRODUCT DIVISION
disinfectant	sodium nitrite	cleaners

(27) PHOSPHATE

PRODUCT	COMPOUND	PRODUCT DIVISION
automatic transmission fluid	zinc dialkyl dithio-phosphate	auto. products
corrosion inhibitors	sodium phosphates	auto. products
radiator cleaners (alkaline)	sodium tripolyphosphate	auto. products
tire cleaners	potassium phosphate	auto. products
commercial bleaches (laundry)	trisodium phosphate	bleach

PHOSPHATE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
household bleaches (liquid)	sodium tripolyphosphate	bleach
polysulfide caulking compound	potassium phosphate	caulking compd.
abrasive cleaners	phosphates	cleaners
aluminum cleaners	sodium tripolyphosphate	cleaners
toilet bowl cleaners	sodium tripolyphosphate	cleaners
boiler cleaners	trisodium phosphate	cleaners
boiler treatment	trisodium phosphate	cleaners
coffee pot cleaners	tripolyphosphate	cleaners
dairy cleaners	sodium tripolyphosphate	cleaners
denture cleaners	calcium phosphates	cleaners
detergents, automatic dishwasher	sodium tripolyphosphate trisodium phosphate	cleaners
detergents, granulated and tablet	sodium phosphate	cleaners
detergents, liquid	potassium pyrophosphate sodium tripolyphosphate trisodium phosphate	cleaners
diaper cleaners	trisodium phosphate sodium tripolyphosphate	cleaners
egg cleanser	sodium tripolyphosphate	cleaners
floor cleaner	sodium polyphosphate trisodium phosphate	cleaners
general cleaner	trisodium phosphate sodium pryophosphate sodium tripolyphosphate sodium potassium phosphate	cleaners
glass (window) cleaners	sodium polyphosphate	cleaners
metal cleaners	trisodium phosphate phosphoric acid tripolyphosphates	cleaners
paint and varnish cleaner	trisodium phosphate tetrasodium pyrophosphate	cleaners
paint and varnish removers	trisodium phosphate	cleaners

PHOSPHATE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
porcelain, marble, tile and enamel cleaners	sodium tripolyphosphate trisodium phosphate	cleaners
rug and upholstery cleaners	trisodium phosphate	cleaners
shoe cleaners	trisodium phosphate	cleaners
stainless steel cleaners	sodium acid phosphate	cleaners
stain, spot, lipstick, rust remover	tetrapotassium pyrophosphate	cleaners
steam cleaners	trisodium phosphate	cleaners
wall cleaners	trisodium phopshate	cleaners
wallpaper cleaner	trisodium phosphate	cleaners
windshield washer solvent	potassium phosphate	cleaners
bath salts	sodium hexametaphosphate	cosmetics
bubble bath	sodium tripolyphosphate	cosmetics
toothpaste	dicalcium phosphate tricalcium phosphate sodium metaphosphate ammonium phosphate calcium pyrophosphate magnesium phosphate	cosmetics
mouthwash	ammonium phosphate	cosmetics
cuticle softener	trisodium phosphate	cosmetics
alkali disinfectant	trisodium phosphate	disinfectants
dairy disinfectant	phosphates	disinfectants
phenol disinfectant	complex phosphates	disinfectants
pine oil	potassium tetrapyro phosphate	disinfectants
ammonium compounds disinfectants	sodium tripolyphosphate	disinfectants
powder extinguisher	ammonium monophosphate	fire exting.
motor fuel	trimethyl phosphate	fuels
motor fuel additive	trimethyl phosphate	fuels
laundry bluing	sodium tripolyphosphate	laundry products
laundry starch	sodium hexametaphosphate sodium tripolyphosphate	laundry products
misc. oils	phosphorus	oils

PHOSPHATE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
motor oils	phosphorus pentasulphide	oils
violet pigment	cobalt phosphate	pigments
swimming pool sanitizer	sodium tripolyphosphate trisodium phosphate	sanitizers
general purpose soaps	sodium phosphate	sanitizers
hand cleaners powdered	sodium phosphate	sanitizers
water treating chemicals	sodium hexametaphosphate	water treating chemicals

(28) POTASSIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
carburetor cleaner	potassium hydroxide	auto. products
corrosion inhibitors	potassium bichromate	auto. products
radiator cleaners (mixed)	potassium dichromate	auto. products
tire cleaners	potassium hydroxide potassium phosphates	auto. products
engine and motor cleaners	potassium hydroxide	auto. products
polysulfide caulking compound	potassium phosphate potassium persulphate	caulking comp'd
boiler cleaners	potassium dichromate	cleaners
detergents, automatic dishwasher	potassium dichloro-s-trazinetrione	cleaners
detergents, liquid	potassium toluene-sulfonate potassium pyrophosphate potassium hydroxide	cleaners
disinfectant cleaners	potassium hydroxide	cleaners
drain and pipe powder	potassium hydroxide	cleaners
floor cleaners	potassium hydroxide	cleaners
furnace and fireplace	potassium nitrate	cleaners
general cleaner	sodium potassium phosphate potassium hydroxide	cleaners
saddle soap	potassium carbonate	cleaners
metal cleaner	potassium soap	cleaners

POTASSIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
paint and varnish remover	potassium oleate potassium bitartrate potassium citrate	cleaners
sewer, cesspool, septic tank cleaners	potassium hydroxide	cleaners
stain, spot, lipstick, rust remover	tetrapotassium pyrophosphate	cleaners
stove and oven cleaner	potassium hydroxide	cleaners
windshield washer solvent	potassium phosphate	cleaners
barrier creams (protective)	potassium hydroxide	cosmetics
bleach and freckle creams	potassium sulphides	cosmetics
freckle lotions	potassium chlorate potassium carbonate	cosmetics
permanent waves-hair preparations	potassium bromate	cosmetics
mouthwash	potassium iodide	cosmetics
cuticle softener	potassium hydroxide	cosmetics
nail bleaches	potassium binoxalate	cosmetics
cream rouge	potassium hydroxide	cosmetics
soap shampoo	potassium coconut oil soap potassium oil soap	cosmetics
shampoo	potassium soap	comestics
shaving cream (lather type)	potassium stearine soap potassium coconut oil soap	cosmetics
shaving lotion	potassium alum	cosmetics
styptic pencil	potassium aluminum sulphate	cosmetics
dairy disinfectant	potassium permanganate	disinfectants
pine oil disinfectant	potassium tetrapyro-phosphate	disinfectants
air drier	potassium chloride	drier
powder extinguisher	potassium sulphate	fire extinguisher
grass and weed killer	potassium cyanate	house and garden pesticides

POTASSIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
lawn pesticide	potassium chromate	house and garden pesticides
ophthalmic ointment	potassium chloride	ointments
driers	potassium hydroxide	paints
developers	potassium bromide potassium iodide potassium metabisulphate potassium thiocyanate	photo. products
fixing baths	potassium aluminum sulphate potassium chromium sulphate potassium metabisulphite potassium thiocyanate	photo. products
hypotest solution	potassium permanganate potassium bromides potassium iodide	photo. products
intensifiers and reducers (chromium)	potassium dichromate	photo. products
mercury intensifiers	potassium dichromate	photo. products
silver intensifers	potassium permanganate	photo. products
farmer's reducers	potassium ferricyanide	photo. products
flattening reducers	potassium ferricyanide potassium bromide	photo. products
harmonizing-bleaching reducer	potassium dichromate potassium permanganate potassium citrate	photo. products
stain remover	potassium permanganate	photo. products
iron toner	potassium ferricyanide	photo. products
sulphide sepia toners	potassium ferricyanide potassium bromide potassium oxalate	photo. products
varigam toners	potassium ferricyanide potassium bromide potassium iodide potassium carbonate potassium thiocyanate	photo. products
hypo alum sepia	potassium alum	photo. products
tray cleaner	potassium dichromate potassium permanganate	photo. products

POTASSIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
blue pigment	potassium silicate	pigments
green pigment	hydrous potassium hydrous potassium silicates	pigments
yellow and brown pigment	potassium cobalti nitrite	pigments
foot powder	potassium alum	powders
douche powder	potassium sulphate potassium alum	powders
swimming pool sanitizer	potassium iodide	sanitizers
light duty soap	potassium carbonate	soaps
water treating chemicals	potassium permanganate potassium iodide	water treating chemicals
arthritis, rheumatic	potassium iodide	medicine
cough syrup	potassium guaiacol sulfonate potassium tartrate potassium iodide	medicine
analgesic	potassium citrate potassium bromide	medicine
hemorrhoids	potassium alum sulphate	medicine
sedative	potassium tartrate potassium guaiacol sulfonate	medicine
bronchial asthma	potassium iodide	medicine

(29) SELENIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
orange pigment	cadmium selenium	pigments

(30) SILICON

PRODUCT	COMPOUND	PRODUCT DIVISION
corrosion inhibitors	silicates sodium metasilicates	auto. products
radiator cleaners (alkaline)	sodium orthosilicate	auto. products

SILICON (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
tire cleaners	metasilicate	auto. products
tire paint (white)	silicates	auto. products
undercoatings	silicates	auto. proudcts
household bleaches, powders	sodium silicate	bleaches
cement sealer	silicates	caulking compound
silicone rubber caulking	silica	caulking compound
abrasive cleaners	silica	cleaners
aluminum cleaners	magnesium silico-fluoride sodium metasilicate	cleaners
toilet bowl cleaners	sodium metasilicate	cleaners
coffee pot cleaners	sodium metasilicate	cleaners
detergents, automatic dishwasher	sodium silicate sodium metasilicate	cleaners
detergents, granulated and tablet	sodium silicate	cleaners
detergents, liquid	sodium silicate	cleaners
diaper cleaners	sodium metasilicate	cleaners
egg cleanser	sodium metasilicate	cleaners
floor cleaner	sodium metasilicate silica	cleaners
general cleaner	sodium silicate silicon alkylaryl sulfonate	cleaners
saddle soap	sodium metasilicate	cleaners
metal cleaners	silicon dioxide magnesium silicofluoride	cleaners
porcelain, marble, tile and enamel cleaners	silica sodium metasilicate	cleaners
rug and upholstery cleaners	sodium silicate	cleaners
stove and oven cleaners	silica sodium orthosilicate	cleaners
Teflon cleaner	sodium metasilicate	cleaners
wall cleaner	silica	cleaners
barrier creams (protective)	sodium silicates	cosmetics
eyebrow pencil	aluminum silicates	cosmetics

SILICON (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
liquid powder make-up	magnesium aluminum silicate	cosmetics
alkali disinfectant	sodium silicate	disinfectants
joint compound filler	aluminum silicate	fillers
ant pesticide	silica	house and garden pesticides
flat wall paint oil primers and sealers	magnesium silicate silicates	paints
gloss enamel and floor enamels	aluminum silicate	paints
house paint, trim paint	silicates	paints
exterior oil, exterior primers	magnesium silicate	paints
latex house paint	magnesium silicate	paints
floor paint	silicates	paints
stain	silicates	paints
copper paint	magnesium silicate	paints
barn paints	silicates	paints
blue pigment	copper silicate calcium silicate potassium silicate aluminum silicate	pigments
red pigment	silica oxide silica	pigments
white pigment	aluminum silicate calcium silicate silica silicon dioxide hydrated magnesium silicate	pigments
foot powder	aluminum silicate	powders
floor preservative	sodium zinc silicate	preservatives
wood preservative	silicate	preservatives
general purpose soap	sodium silicate	soaps
light duty soap	sodium silicate	soaps
toilet bar soap	sodium silicate	soaps

SILICON (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
water treating chemicals	sodium aluminum silicates	water treating chemicals
gastric antacid	magnesium trisilicate	medicine
antacid	magnesium trisilicate	medicine

(31) SILVER

PRODUCT	COMPOUND	PRODUCT DIVISION
hair preparation	silver nitrate	cosmetics
hypotest solution	silver nitrate	photo. products
mercury intensifiers	silver nitrate	photo. products
silver intensifiers	silver nitrate	photo. products
gold toner	silver nitrate	photo. products
hypo alum sepia	silver nitrate	photo. products
silver polish	silver nitrate	polish

(32) SODIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
antifreeze	sodium mercaptobenzothiazole	auto. products
carburetor cleaner	sodium chromate	auto. products
corrosion inhibitors	sodium chromate sodium nitrate sodium carbonate sodium metasilicates sodium phosphates	auto. products
radiator cleaners (alkaline)	sodium orthosilicate sodium tripolyphosphate sodium dichromate sodium chromate	auto. products
(mixed)	sodium carbonate	auto. products
(acid)	sodium bisulphite	auto. products
car wash compounds	sodium sulphate alkyl aryl sodium sulfonate	auto. products
household bleaches, powder	sodium silicate	bleaches
wood bleaches	sodium silicate sodium hydrosulphite	bleaches

SODIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DISIVION
commercial bleaches (laundry)	sodium dithionate sodium hydrosulphite sodium perborate sodium peroxide trisodium phosphate	bleaches
laundry bleaches, liquid	sodium hypochlorite sodium carbonate sodium hydroxide sodium chloride	bleaches
household bleach, liquid	sodium hypochlorite sodium chloride sodium hydroxide sodium carbonate	bleaches
household bleach, powder	sodium tripolyphosphate sodium silicate sodium sulphate	bleaches
abrasive cleaner	sodium sulphate sodium carbonate sodium hypochlorite sodium perchlorate sodium stearate	cleaners
aluminum cleaner	sodium metasilicate sodium tripolyphosphate sodium bicarbonate sodium fluoride	cleaners
toilet bowl cleaner	sodium acid sulphate sodium sulphate sodium chloride sodium carbonate sodium metasilicate sodium nitrate sodium tripolyphosphate	cleaners
boiler cleaner	sodium fluoride sodium carbonate trisodium phosphate	cleaners
boiler treatments	sodium carbonate trisodium phosphate sodium dichromate sodium borate	cleaners
coffee pot cleaner	sodium metasilicate sodium sulfonate	cleaners

SODIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DISIVION
dairy cleaners	sodium bicarbonate sodium hydroxide sodium tripolyphosphate sodium bicarbonate	cleaners
denture cleaners	sodium perborate sodium chloride sodium carbonate trisodium phosphate sodium peroxide	cleaners
detergents, automatic dishwasher	sodium tripolyphosphate sodium silicate trisodium phosphate sodium hypochlorite	cleaners
detergents, granulated and tablet	sodium phosphate sodium sulphate sodium chloride sodium silicate sodium carbonate sodium perborate	cleaners
detergents, liquid	sodium toluenesulfonate sodium silicate sodium nitrate sodium sulphate sodium tripolyphosphate trisodium phosphate	cleaners
diaper cleaners	sodium metasilicate trisodium phosphate sodium perborate sodium tripolyphosphate	cleaners
disinfectant cleaners	sodium carbonate sodium sulphite sodium nitrate sodium hydroxide	cleaners
drain and pipe power	sodium hydroxide sodium nitrate sodium chloride sodium carbonate	cleaners
egg cleanser	sodium tripolyphosphate sodium metasilicate sodium carbonate	cleaners

SODIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
floor cleaners	sodium polyphosphate sodium perborate sodium metasilicate trisodium phosphate	cleaners
furnace and fireplace general cleaner	sodium chloride trisodium phosphate sodium carbonate sodium sesqui carbonate sodium pyrophosphate sodium tripolyphosphate sodium silicate sodium sulfonate sodium potassium phosphate	cleaners
glass (window) cleaner	sodium polyphosphate	cleaners
saddle soap	sodium metasilicate	cleaners
metal cleaners	trisodium phosphate sodium metasilicate sodium carbonate	cleaners
monument cleaners	sodium bifluoride sodium hydrosulphite	cleaners
paint and varnish cleaner	trisodium phosphate sodium carbonate tetrasodium pyrophosphate	cleaners
paint and varnish removers	sodium sesqui carbonate trisodium phosphate	cleaners
porcelain, marble, tile and enamel cleaners	sodium tripolyphosphate trisodium phosphate sodium metasilicate	cleaners
rug and upholstery cleaners	sodium carbonate trisodium phosphate sodium lauryl phosphate sodium silicate sodium sulphate sodium bicarbonate sodium chloride	cleaners
sewer, cesspool, septic tank cleaners	sodium hydroxide sodium carbonate sodium bisulphate sodium chloride	cleaners
shoe cleaners	trisodium phosphate	cleaners
stainless steel cleaners	sodium chloride sodium acid phosphates	cleaners

SODIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
stain, spot, lipstick, rust remover	sodium hypochlorite sodium sulphate sodium thiosulphate	cleaners
steam cleaners	trisodium phosphate	cleaners
stove and oven cleaner	sodium hydroxide sodium orthosilicate sodium xylene sulfonate	cleaners
Teflon cleaner	sodium perborate sodium metasilicate	cleaners
wall cleaners	sodium lauryl sulphate trisodium phosphate	cleaners
barrier creams (protective)	sodium silicates	cosmetics
ant pesticides	sodium sodium arsenate sodium carbonate sodium chloride sodium cyanide sodium fluoride sodium silicofluoride sodium arsenite	house and garden pesticides
garden pesticides	sodium aluminum fluoride	house and garden pesticides
grass and weed killer	sodium arsenite sodium chlorate sodium metaborate	house and garden pesticides
roach killer	sodium borate sodium chloride sodium fluoride sodium silicofluoride sodium sulphate	house and garden pesticides
laundry bluing	sodium sulphate sodium tripolyphosphate sodium bicarbonate	laundry products
laundry starch	sodium chloride sodium hexametaphosphate sodium tripolyphosphate	laundry products
skin ointment	sodium sulphate	ointments
ophthalmic ointment	sodium carbonate	ointments
fungicidal ointment	sodium caprylate	ointments
varnishes, shellacs	sodium hydroxide	paints

(32) SODIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
developers	sodium thiocyanate sodium bisulphite sodium carbonate sodium hydroxide sodium metaborate sodium sulphate	photo. products
fixing baths	sodium thiosulphate sodium sulphite sodium bisulphite	photo. products
hardeners	sodium carbonate sodium sulphite or bisulphite	photo. products
hypotest solution	sodium hydroxide	photo. products
mercury intensifiers	sodium cyanide sodium bisulphite sodium theosulphate	photo. products
silver intensifiers	sodium sulphite sodium thiosulphite	photo. products
farmer's reducers	sodium thiosulphite	photo. products
harmonizing-bleaching reducer	sodium sulphite	photo. products
stain remover	sodium chloride	photo. products
gold toner	sodium thiosulphate sodium chloride	photo. products
sulphide sepia toners	sodium sulphide	photo. products
varigam toners	sodium chloride sodium hydroxide sodium carbonate	photo. products
hypo alum sepia	sodium thiosulphate sodium chloride	photo. products
tray cleaner	sodium bisulphite sodium sulphate	photo. products
silver polish	sodium thiosulphate	polishes
foot powder	sodium salts	powders
douche powder	sodium caprylate	powders
floor preservative	sodium zinc silicate	preservatives

SODIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
swimming pool sanitizer	sodium hypochlorite sodium carbonate sodium tripolyphosphate trisodium phosphate	sanitizers
bath salts	trisodium phosphate sodium chloride sodium hexametaphosphate sodium bicarbonate	cosmetics
bubble bath	sodium lauryl sulphate sodium chloride sodium sulphate sodium tripolyphosphate	cosmetics
freckle lotions	sodium borate	cosmetics
conditioning (skin) creams	sodium lauryl sulphate	cosmetics
liquid toothpaste	sodium alginate sodium lauryl sulphate	cosmetics
toothpaste	sodium lauryl sulphate	cosmetics
tooth powder	sodium metaphosphate sodium lauryl sulfo-acetate sodium benzoate sodium bicarbonate sodium fluoride	cosmetics
deodorant cream	sodium lauryl sulphate	cosmetics
deodorant stick	sodium stearate	cosmetics
depilatory cream	sodium lauryl sulphate	cosmetics
eye creams	sodium benzoate	cosmetics
foundation creams	sodium alginate sodium sulphate sodium thiosulphate	cosmetics
lacquers and wave sets	sodium alginate	cosmetics
permanent waves - hair preparations	sodium lauryl sulphate sodium bromate sodium perborate	cosmetics
liquefying creams	sodium borate	cosmetics
liquid powder	sodium hydroxide	cosmetics
mouthwashes	sodium bicarbonate sodium chloride sodium cyclamate	cosmetics

SODIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
cuticle softener	sodium carbonate trisodium phosphate	cosmetics
perfumes, toilet waters and colognes	sodium stearate	cosmetics
soapless shampoo	sodium lauryl sulphate sodium stearate trisodium phosphate	cosmetics
shaving cream (brushless)	sodium alginate sodium salicylate	cosmetics
shaving cream (lather type)	sodium stearine soap sodium coconut oil soap sodium alginate sodium salicylate	cosmetics
bathroom deodorant	sodium bisulphate	deodorizers
garbage can deodorant	sodium chloride sodium hypochlorite	deodorizers
disinfectant (alkali)	sodium hydroxide sodium carbonate sodium silicate	disinfectants
dairy disinfectants	trisodium phosphates sodium chloride alkyl sodium sulphate	disinfectants
liquid disinfectants	sodium hypochlorite sodium hydroxide sodium chloride sodium borate	disinfectants
ammonium compound	sodium carbonate sodium tripolyphosphate	disinfectants
air driers	sodium tripolyphosphate	driers
rug dyes	sodium chloride sodium sulphate	dyes
foam fire extinguishers	sodium bicarbonate	fire extinguishers
liquid fire extinguishers	sodium hydroxide sodium dichromate	fire extinguishers
powder extinguishers	sodium bicarbonate	fire extinguishers
general purpose soaps	sodium silicate sodium carbonate sodium phosphate sodium perborate	soaps

SODIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
hand cleaners, powdered	sodium phosphate sodium carbonate	soaps
light duty soaps	sodium silicate sodium carbonate	soaps
toilet bar soaps	sodium silicate sodium sulphate	soaps
water treating chemicals	sodium aluminum silicates sodium sulphate sodium hexametaphosphate	water treat. chem.
arthritis, rheumatic	sodium bicarbonate sodium salicylate	medicine
antacid	sodium bicarbonate sodium chloride	medicine
sedative	sodium bromide	medicine

(33) STRONTIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
marking inks	strontium zinc sulphide	ink
yellow and brown pigment	strontium chromate	pigments
luminous pigment	calcium-strontium sulphide	pigments
arthritis, rheumatic	strontium salicylate	medicine
sedative	strontium bromide	medicine

(34) SULPHATE

PRODUCT	COMPOUND	PRODUCT DIVISION
car wash compounds	sodium sulphate	auto. products
household bleach, powder	sodium sulphate	bleaches
abrasive cleaner	sodium sulphate potassium persulphate	cleaners
toilet bowl cleaners	sodium acid sulphate sodium sulphate	cleaners
denture cleaners	magnesium sulphate	cleaners
detergents, granulated and tablet	sodium sulphate	cleaners
liquid detergents	sodium sulphate ammonium sulphate	cleaners

SULPHATE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
furnace and fireplace	copper sulphate	cleaners
rug and upholstery cleaners	sodium lauryl sulphate sodium sulphate	cleaners
sewer, cesspool, septic tank cleaners	sodium bisulphate copper sulphate aluminum sulphate sodium sulphate	cleaners
stain, spot, lipstick, rust remover	sodium thiosulphate	cleaners
wall cleaners	sodium lauryl sulphate	cleaners
wallpaper remover	sodium tetradecylsulphate	cleaners
bubble bath	sodium lauryl sulphate sodium sulphate	cosmetics
conditioning (skin) creams	sodium lauryl sulphate	cosmetics
liquid toothpaste	sodium lauryl sulphate	cosmetics
toothpaste	sodium lauryl sulphate calcium sulphate	cosmetics
deodorant cream	aluminum sulphate sodium lauryl sulphate	cosmetics
roll-on deodorant	aluminum sulphate	cosmetics
depilatory cream	sodium lauryl sulphate	cosmetics
dyes, tints - hair prep.	manganese sulphate nickle sulphate sodium sulphite sodium thiosulphate ferrous sulphate copper sulphate	cosmetics
face powder	barium sulphate	cosmetics
soapless shampoo	sodium lauryl sulphate	cosmetics
shampoo	cadmium lauryl sulphate magnesium lauryl sulphate	cosmetics
styptic pencil	potassium aluminum sulphate	cosmetics
skin freshener	zinc sulphate	cosmetics

SULPHATE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
bathroom deodorant	sodium bisulphate	deodorizers
cleanser type deodorant	magnesium sulphate	deodorizers
dairy disinfectants	alkyl sodium sulphate	disinfectants
rug dyes	sodium sulphate	dyes
foam fire extinguisher	aluminum sulphate	fire extinguishers
powder extinguisher	potassium sulphate	fire extinguishers
garden pesticides	copper-zinc sulphate	house and garden pesticides
lawn pesticides	ferrous sulphate	house and garden pesticides
roach killer	sodium sulphate	house and garden pesticides
peach spray	zinc sulphate	house and garden pesticides
tomato dust	copper sulphate	house and garden pesticides
laundry bluing	sodium sulphate	laundry products
skin ointment	aluminum sulphate sodium sulphate copper sulphate	ointments
ophthalmic ointment	cobalt sulphate	ointments
traffic paint	lead sulphate	paints
house paint, trim paint, exterior oil, exterior primers	calcium sulphate	paints
floor paint	barium sulphate	paints
barn paint	calcium sulphate	paints
developers	sodium sulphate	photo. products
fixing baths	potassium aluminum sulphate potassium chromium sulphate	photo. products
hardeners	aluminum sulphate	photo. products
harmonizing-bleaching reducer	ferric ammonium sulphate	photo. products
gold toner	sodium thiosulphate potassium persulphate	photo. products

SULPHATE (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
hypo alum sepia	sodium thiosulphate	photo. products
tray cleaner	sodium sulphate	photo. products
orange pigment	barium sulphate lead sulphate	pigments
white pigment	calcium sulphate lead sulphate	pigments
douche powder	aluminum sulphate potassium sulphate zinc sulphate magnesium sulphate	powders
floor preservative	sulphates	preservatives
toilet bar soap	sodium sulphate	soaps
water treating chemicals	sodium sulphate copper sulphate zinc sulphate	water treating chemicals
hemorrhoids	zinc sulphate copper sulphate	medicine
enema	copper sulphate ferrous sulphate	medicine
sedative	ferrous sulphate	medicine

(35) TIN

PRODUCT	COMPOUND	PRODUCT DIVISION
tooth powder	stannous fluoride	cosmetics
hardeners	stannic chloride	photo. products
yellow and brown pigments	stannic sulphide	pigments
metallic pigment	tin	pigments

(36) TITANIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
leather and rubber coating	titanium dioxide	auto. products
white tire paint	titanium dioxide	auto. products
undercoatings	titanium dioxide	auto. products
caulking compounds	titanium dioxide	caulking compounds
cement sealer	titanium dioxide	caulking compounds

TITANIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
polysulphide caulking compound	titanium dioxide	caulking compounds
silicone rubber caulking	titanium dioxide	caulking compounds
shoe cleaners	titanium dioxide	cleaners
barrier creams (protective)	titanium dioxide	cosmetics
bleach and freckle creams and ointments	titanium dioxide	cosmetics
tootphaste	titanium dioxide	cosmetics
eye shadow	titanium dioxide	cosmetics
eye liner	titanium dioxide	cosmetics
face packs	titanium dioxide	cosmetics
liquid powders	titanium dioxide	cosmetics
nail whites cream	titanium dioxide	cosmetics
nail whites liquid	titanium dioxide	cosmetics
face powder	titanium dioxide	cosmetics
cream rouge	titanium dioxide	cosmetics
lipsticks	titanium dioxide	cosmetics
hand lotion	titanium dioxide	cosmetics
joint compound filler	titanium dioxide	cosmetics
pigmented inks	titanium dioxide	inks
antialgae paints	titanium dioxide	paints
traffic paints	titanium calcium	paints
flat wall paint oil	titanium dioxide	paints
primers and sealers	titanium calcium titanium magnesium	paints
gloss enamel and floor enamels	titanium dioxide titanium calcium	paints
house paint, trim paint, exterior oil, exterior primers	titanium dioxide titanium calcium titanium magnesium	paints
latex house paint	titanium dioxide	paints
semi-gloss satin or eggshell enamel	titanium dioxide titanium calcium	paints
floor paint	titanium calcium titanium dioxide	paints

TITANIUM (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
heat resistant paint	titanium	paints
stain	titanium dioxide	paints
white pigment	lead titanium dioxide	pigments
yellow and brown pigment	titanium dioxide	pigments
silver polish	titanium dioxide	polishes
toilet bar soap	titanium dioxide	soaps

(37) VANADIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
drier	vanadium compounds	paints

(38) ZINC

PRODUCT	COMPOUND	PRODUCT DIVISION
rust inhibitor antifreeze	zinc chloride	auto. products
automatic transmission fluids	zinc dialkyl dithio-phosphate	auto. products
undercoatings	zinc or zinc salts	auto. products
caulking compounds	zinc oxide	caulking comp'd.
toilet bowl cleaners	zinc chloride	cleaners
floor cleaners	zinc stearate	cleaners
furnace and fireplace	zinc 8% liquid lino-resinate	cleaners
baby preparation powder	zinc oxide	cosmetics
barrier creams	zinc oxide zinc stearate	cosmetics
bleach and freckle creams and ointments	zinc oxide zinc peroxide zinc sulphide zinc oxides	cosmetics
conditioning (skin) cream	zinc oxides	cosmetics
deodorant stick	zinc oxides	cosmetics
spary deodorant	zinc phenol sulfonate	cosmetics
depilatory cream	zinc oxide	cosmetics

ZINC (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
face packs	zinc stearate zinc oxide zonc sulfocarbolate	cosmetics
foundation creams	zinc stearate	cosmetics
liquid make-ups	zinc oxide zinc stearate	cosmetics
mouthwash	zinc chloride zinc oxide	cosmetics
body powder	zinc stearate zinc oxide	cosmetics
cake rouge	zinc oxide zinc stearate	cosmetics
shampoo	zinc pyrithione	cosmetics
shaving cream (brushless type)	zinc compounds	cosmetics
shaving cream (lather type)	zinc compounds	cosmetics
shaving lotions	zinc pheolsulfonate	cosmetics
astringent	zinc sulphate zinc oxide	cosmetics
hand lotion	zinc oxide zinc carbonate	cosmetics
skin freshener	zinc sulphate zinc oxide	cosmetics
spray type deodorizer	zinc phenolsulfonate	deodorizers
soldering paste	zinc halide	fillers
foam fire extinguisher	zinc salts	fire extinguishers
powder extinguisher	zinc stearate	fire extinguishers
flower garden pesticides	zinc copper zinc chromate	house and garden pesticides
garden pesticides	zinc	house and garden pesticides
moth spray	zinc silicofluoride	house and garden pesticides
peach spray	zinc sulphate	house and garden pesticides

ZINC (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
mouse killer	zinc phosphide	house and garden pesticides
soil nutrient	zinc	house and garden pesticides
pigmented inks	zinc oxide	inks
greases	zinc salt	lubricants
gear oil	zinc dialkyl dithiophosphate	lubricants
misc. oils	zinc	oils
motor oils	zinc dialkyl dithiophosphate	oils
skin ointment	zinc carbonate zinc oxide	ointments
ophthalmic ointment	zinc oxide zinc sulphate	ointments
fungicidal ointment	zinc caprylate	ointments
antialgae paints	zinc oxide	paints
anticorrosion paints	zinc chromate zinc oxide	paints
driers	zinc compounds	paints
flat wall paint oil, primers and sealers	zinc oxide	paints
gloss enamel and floor enamel	zinc chromate	paints
house paint, trim paint, exterior oil	zinc oxide	paints
latex house paint	zinc oxide	paints
metal primer	zinc chromate	paints
orange pigment	zinc sulphide	pigments
white pigment	zinc oxide zinc sulphide	pigments
yellow and brown pigment	zinc oxide zinc chromate	pigments
metallic pigment	zinc	pigments
luminous pigment	zinc sulphide	pigments
general purpose polish	zinc stearate	polishes
shoe polish	zinc salts	polishes

ZINC (Cont'd)

PRODUCT	COMPOUND	PRODUCT DIVISION
foot powder	zinc undecyclenate zinc stearate	powders
douche powder	zinc sulphate zinc phenolsulfonate	powders
dusting powder	zinc stearate	powders
medicated powder	zinc oxide	powders
floor preservative	sodium zinc silicate	preservatives
wood preservative	zinc naphthenate	preservatives
suppositories	zinc oxide zinc phenolsulfonate zinc sulphate	suppositories
water treating chemicals	zinc sulphate	water treat. chem.
gastric antacid	zinc phenolsulfonate	medicine
hemorrhoids	zinc sulphate	medicine

(39) ZIRCONIUM

PRODUCT	COMPOUND	PRODUCT DIVISION
skin ointment	zirconium oxide	ointment
analgesic	zirconium oxide	medicine

5. SOURCES OF METALS FROM INDUSTRIAL AREAS

5.1 Introduction

Most people tend to assume that:

(1) industrial operations are largely responsible for the major portion of most metals that are discharged to a sanitary sewerage system, and

(2) point-source treatment of industrial effluents would resolve all or most of the metal-related problems that currently plague sewage treatment plants.

In theory these assumptions are essentially correct but, in practice, each assumption is subject to interpretation. For instance, while it does appear that, in an overall sense, industrial sources do contribute the bulk of the metals in question, it does not necessarily follow that the elimination of all industrial discharges to a sanitary sewerage system would simultaneously eliminate all metal problems at the treatment plant serving the system. The complex chemistry of modern-day domestic sewage precludes this possibility. In addition, it should be realized that point-source treatment of industrial discharges in Ontario at the present time is the rule rather than the exception. Also, most municipalities in the Province actually regulate industrial discharges to sanitary sewer systems via sewer-use by-laws (see Section 3 of this report).

In this Section, an attempt is made to define the industrial: domestic input to the specific plants that serve the individual municipalities that are discussed in Section 6. The specific types of industry found in each community are also identified. However, it should be noted that many industrial operations are "dry" (that is, these operations do not discharge industrial wastes to a municipal sewer even though the sanitary facilities at the plant may be connected to the municipal sewer) and others may treat their industrial wastes in privately-owned plants with subsequent discharge to a natural watercourse.

Information on industrial and domestic input percentages was obtained by personal communication with personnel at the specific plants in the sampling program (see Section 6). The "Industrial Surveys of

Ontario Municipalities, 1976", published by the Ministry of Industry and Tourism, provided the list of industries for each sample municipality.

For the purpose of convenience, manufacturing operations have been broken down into the following manufacturing groups. A group number has been assigned to each group.

5.2 Manufacturing Groups

GROUP NUMBER 1 - FOOD AND KINDRED PRODUCTS

(i) Meat Packing Plants
(ii) Sausage and Other Prepared Meat Products
(iii) Creamery Butter
(iv) Cheese - Natural and Processed
(v) Condensed and Evaporated Milk
(vi) Ice Cream and Frozen Desserts
(vii) Fluid Milk
(viii) Canned Fruits, Vegetable, Preserves - Jams and Jellies
(ix) Dried and Dehydrated Fruits and Vegetables
(x) Frozen Fruits, Fruit Juices
(xi) Prepared Feed for Animals and Fowl
(xii) Bread and other Bakery Products
(xiii) Candy and Other Confectionery Products
(xiv) Wines, Brandy and Brandy Spirits
(xv) Bottled and Canned Soft Drinks
(xvi) Miscellaneous Food Preparations and Kindred Products
(xvii) Manufactured Ice
(xviii) Food Preparations

GROUP NUMBER 2 - TEXTILE MILL PRODUCTS

(i) Broad Woven Fabric Mills - Cotton
(ii) Broad Woven Fabric Mills, Man-Made Fibre and Silk
(iii) Full Fashioned Hosiery Mills
(iv) Seamless Hosiery Mills
(v) Knit Outer Wear Mills
(vi) Non-Woven Fabrics
(vii) Textile Goods - Not Elsewhere Classified

GROUP NUMBER 3 - APPAREL AND OTHER FINISHED PRODUCTS

(i) Clothing

(ii) Curtains and Draperies

(iii) Textile Bags

(iv) Canvas Products

(v) Fabricated Textile Products - Not Elsewhere Classified

GROUP NUMBER 4 - LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE

(i) Special Product Sawmills

(ii) Millwork Plants

(iii) Wood Kitchen Cabinets

(iv) Nailed and Lock Corner Wooden Boxes and Shook

(v) Prefabricated Wooden Buildings and Components

(vi) Wood Preserving

(vii) Wood Products - Not Elsewhere Classified

GROUP NUMBER 5 - FURNITURE AND FIXTURES

(i) Wood Household Furniture

(ii) Wood Household Furniture - Upholstered

(iii) Public Building and Related Furniture

(iv) Wood Partitions, Shelving, Lockers and Office and Store Fixtures

(v) Miscellaneous Furniture and Fixtures

(vi) Drapery Hardware and Window Blinds and Shades

GROUP NUMBER 6 - PAPER AND ALLIED PRODUCTS

(i) Paper Mills - Except Building Paper Mills

(ii) Commercial Printing - Letterpress and Screen

(iii) Commercial Printing - Lithographic

(iv) Engraving and Plate Printing

(v) Manifold Business Forms Manufacturing

(vi) Typesetting

GROUP NUMBER 7 - PRINTING, PUBLISHING AND ALLIED PRODUCTS

(i) Newspapers: Publishing and Printing

(ii) Commercial Printing - Letterpress and Screen

(iii) Commercial Printing - Lithographic

(iv) Engraving and Plate Printing

(v) Manifold Business Forms Manufacturing

(vi) Typesetting

GROUP NUMBER 8 - CHEMICALS AND ALLIED PRODUCTS

(i) Industrial Inorganic Chemicals - Not Elsewhere Classified

(ii) Paints, Varnish, Lacquers and Enamels and Allied Products

(iii) Gum and Wood Chemicals

(iv) Industrial Organic Chemicals - Not Elsehwere Classified

(v) Adhesives and Sealants

(vi) Chemicals and Chemical Preparations - Not Elsehwere Classified

GROUP NUMBER 9 - PETROLEUM REFINING AND RELATED INDUSTRIES

(i) Paving Mixtures and Blocks

GROUP NUMBER 10 - RUBBER AND MISCELLANEOUS PLASTIC PRODUCTS

(i) Tires and Inner Tubes

(ii) Fabricated Rubber Products - Not Elsewhere Classified

(iii) Miscellaneous Plastic Products

GROUP NUMBER 11 - LEATHER AND LEATHER PRODUCTS

(i) Leather Tanning and Finishing

(ii) Leather Goods - Not Elsewhere Classified

GROUP NUMBER 12 - STONE, CLAY AND GLASS PRODUCTS

(i) Glass Products - Made of Purchased Glass

(ii) Brick and Structural Clay Tile

(iii) Structural Clay Products - Not Elsewhere Classified

(iv) Pottery Products - Not Elsewhere Classified

(v) Concrete Products - Except Block and Brick

(vi) Ready Mix Concrete

(vii) Lime

(viii) Cut Stone and Stone Products

(ix) Abrasive Products

(x) Mineral Wool

GROUP NUMBER 13 - PRIMARY METAL INDUSTRIES

(i) Gray Iron Foundries

(ii) Malleable Iron Foundries

(iii) Steel Foundries

(iv) Aluminum Castings

(v) Brass, Bronze, Copper - Copper Base Alloy Castings

(vi) Nonferrous Castings

(vii) Iron and Steel Forgings

GROUP NUMBER 14 - FABRICATED METAL PRODUCTS, EXCEPT ORDNANCE, MACHINERY, AND TRANSPORTATION EQUIPMENT

(i) Hand and Edge Tools, Except Machine tools and Hand Saws

(ii) Hardware - Not Elsewhere Classified

(iii) Heating Equipment

(iv) Fabricated Structural Steel

(v) Metal Doors, Sash, Frames, Moulding and Trim

(vi) Fabricated Plate Work - Boiler Shops

(vii) Sheet Metal Work

(viii) Architectural and Ornamental Metal Works

(ix) Miscellaneous Metal Work

(x) Screw Machine Products

(xi) Metal Stampings

(xii) Electroplating, Plating, Polishing, Anodizing and Colouring

(xiii) Coating, Engraving and Allied Services - Not Elsehwere Classified

(xiv) Miscellaneous Fabricated Metal Products

(xv) Steel Springs

(xvi) Valves and Pipe Fittings - Except Plumbers' Brass Goods

(xvii) Miscellaneous Fabricated Metal Products

(xviii) Fabricated Pipe and Pipe Fittings

GROUP NUMBER 15 - MACHINERY - EXCEPT ELECTRICAL

(i) Steam Engines, Steam, Gas and Hydraulic Turbines and Steam, Gas and Hydraulic Turbine Generator Set Units

(ii) Internal Combustion Engines - Not Elsewhere Classified

(iii) Farm Machinery and Equipment

(iv) Construction Machinery and Equipment

(v) Mining Machinery and Equipment

(vi) Elevators and Moving Stairways

(vii) Hoists, Industrial Cranes and Monorail systems

(viii) Special Dies and Tools, Die Sets, Jigs and Fixtures

(ix) Machine Tool Accessories and Measuring Devices

(x) Pumps and Pumping Equipment

(xi) Ball and Roller Bearings

(xii) Industrial Patterns

(xiii) Speed Changers, Industrial High Speed Drives and Gears

(xvi) General Industrial Machinery and Equipment - Not Elsewhere Classified

(xv) Automatic Merchandising Machines

(xvi) Air Conditioning, Air Heating Equipment and Commercial and Industrial Refrigeration Equipment

(xvii) Service Industry Machines - Not Elsewhere Classified

(xviii) Machinery and Parts - Except Electrical - Not Elsewhere Classified

GROUP NUMBER 16 - ELECTRICAL MACHINERY, EQUIPMENT AND SUPPLIES

(i) Power, Distribution and Specialty Transformers

(ii) Switchgear and Switchboard Apparatus

(iii) Industrial Controls

(iv) Welding Apparatus, Electric

(v) Electrical Industrial Apparatus - Not Elsewhere Classified

(vi) Current Carrying Wiring Services

(vii) Non-Current Carrying Wiring Devices

(viii) Electronic Components and Accessories - Not Elsewhere Classified

(ix) Electrical Machinery, Equipment and Supplies - Not Elsewhere Classified

GROUP NO. 17 - TRANSPORTATION EQUIPMENT

(i) Truck and Bus Bodies

(ii) Motor Vehicle Parts and Accessories

(iii) Aircraft Parts

(iv) Shipbuilding and Repairing

(v) Boat Building and Repairing

GROUP NUMBER 18 - PROFESSIONAL, SCIENTIFIC AND CONTROLLING INSTRUMENTS: PHOTOGRAPHIC AND OPTICAL GOODS, WATCHES AND CLOCKS

(i) Engineering, Laboratory and Scientific and Research Instruments

(ii) Dental Equipment and Supplies

(iii) Ophthalmic Goods

(iv) Watches, Clocks, Clockwork Operated Devices and Parts

GROUP NUMBER 19 - MISCELLANEOUS MANUFACTURING INDUSTRIES

(i) Sporting and Athletic Goods

(ii) Marking Devices

(iii) Needles, Pins, Hooks, Eyes and Similar Notions

(iv) Signs and Advertising Displays

(v) Manufacturing Industries - Not Elsewhere Classified

5.3 Industrial Character of Municipalities Served by Lagoons

ELMVALE

Industrial input - 0%

Domestic input - 100%

Manufacturing Groups	Number of Industries
Lumber and wood products, except furniture	1
Printing, publishing and allied products	1
Total number of industries	2

MARKDALE

Industrial input - 10%

Domestic input - 90%

Manufacturing Groups	Number of Industries
Food and kindred products	1
Apparel and other finished products made from fabrics and similar materials	1
Furniture and Fixtures	1
Total number of industries	3

STAYNER

Industrial input - 20%

Domestic input - 80%

Manufacturing Groups	Number of Industries
Food and kindred products	2
Total number of industries	2

SHELBURNE

Industrial input - 100%

Domestic input - 0%

Manufacturing Groups	Number of Industries
Food and kindred products	1
Textile mill products	1
Lumber and wood products, except furniture	2
Printing, publishing and allied products	1
Fabricated metal products, except ordnance machinery and transportation equipment	1
Miscellaneous manufacturing industries	1
Total number of industries	7

5.4 Industrial Character of Municipalities Served by Primary Treatment Plants

PRESCOTT

Industrial input - 10%

Domestic input - 90%

Manufacturing Groups	Number of Industries
Apparel and other finished products made from fabrics and similar materials	3
Paper and allied products	2
Printing, publishing and allied products	1
Rubber and miscellaneous plastic products	1
Fabricated metal products, except ordnance machinery and transportation equipment	4
Electrical machinery, equipment and supplies	1
Total number of industries	12

COLLINGWOOD

Industrial input - 60%

Domestic input - 40%

Manufacturing Groups	Number of Industries
Food and kindred products	1
Textile mill products	2
Furniture and fixtures	1
Chemicals and allied products	1
Rubber and miscellaneous plastic products	2
Stone, clay and glass products	5
Machinery - except electrical	1
Transportation equipment	2
Miscellaneous manufacturing industries	1
Total number of industries	16

MIDLAND

Industrial input - 80%

Domestic input - 20%

Manufacturing Groups	Number of Industries
Food and kindred products	2
Textile mill products	1
Apparel and other finished products made from fabrics and similar materials	2
Lumber and wood products, except furniture	1
Furniture and fixtures	1
Chemicals and allied products	1
Rubber and miscellaneous plastic products	2
Stone, clay and glass products	3
Fabricated metal products, except ordnance, machinery and transportation equipment	7
Machinery - except electrical	1
Electrical machinery, equipment and supplies	2
Professional, scientific and controlling instruments: photographic and optical goods, watches and clocks	2
Total number of industries	25

OWEN SOUND

Industrial input - 60%

Domestic input - 40%

Manufacturing Groups	Number of Industries
Food and kindred products	4
Lumber and wood products, except furniture	1
Paper and allied products	1
Printing, publishing and allied products	2
Chemicals and allied products	1
Rubber and miscellaneous plastic products	1
Stone, clay and glass products	1
Fabricated metal products, except ordnance, machinery and transportation equipment	2
Machinery - except electrical	2
Electrical machinery, equipment and supplies	3
Transportation equipment	2
Total number of industries	20

CORNWALL

Industrial input - 40%

Domestic input - 60%

Manufacturing Groups	Number of Industries
Food and kindred products	4
Textile mill products	8
Apparel and other finished products made from fabrics and similar materials	5
Lumber and wood products, except furniture	1
Furniture and fixtures	1
Paper and allied products	5
Printing, publishing and allied products	2
Chemicals and allied products	9
Rubber and miscellaneous plastic products	2
Stone, clay and glass products	6
Fabricated metal products, except ordnance machinery and transportation equipment	4

Manufacturing Groups	Number of Industries
Machinery - except electrical	4
Electrical machinery, equipment and supplies	2
Transportation equipment	3
Total number of industries	56

5.5 Industrial Character of Municipalities Served by Activated Sludge Plants

The Elizabeth Gardens' sewage treatment plant receives almost total domestic input from the surrounding residential area. Therefore, an industrial survey was not done.

ELMIRA

Industrial input - 60%

Domestic input - 40%

Manufacturing Groups	Number of Industries
Textile mill products	2
Apparel and other finished products made from fabrics and similar materials	1
Furniture and fixtures	1
Chemicals and allied products	3
Fabricated metal products, except ordnance, machinery and transportation equipment	1
Machinery - except electrical	3
Total number of industries	11*

FERGUS

Industrial input - 50%

Domestic input - 50%

* This industrial list is not complete in that the smaller industries are not listed.

Manufacturing Groups	Number of Industries
Food and kindred products	3
Textile mill products	1
Lumber and wood products, except furniture	4
Furniture and fixtures	1
Paper and allied products	1
Printing, publishing and allied products	1
Chemicals and allied products	1
Leather and leather products	1
Primary metal industries	1
Fabricated metal products, except ordnance, machinery and transportation equipment	1
Machinery - except electrical	1
Electrical machinery, equipment and supplies	1
Miscellaneous manufacturing industries	1
Total number of industries	18

ORANGEVILLE

Industrial input - 30%

Domestic input - 70%

Manufacturing Groups	Number of Industries
Paper and allied products	1
Chemicals and allied products	2
Rubber and miscellaneous plastic products	4
Fabricated metal products, except ordnance, machinery and transportation equipment	1
Machinery - except electrical	1
Electrical machinery, equipment and supplies	2
Transportation equipment	3
Total number of industries	14

STRATFORD

Industrial input - 40%

Domestic input - 60%

Manufacturing Groups	Number of Industries
Food and kindred products	9
Apparel and other finished products made from fabrics and similar materials	2
Lumber and wood products, except furniture	1
Furniture and fixtures	3
Paper and allied products	4
Printing, publishing and allied products	5
Chemicals and allied products	2
Rubber and miscellaneous plastic products	2
Leather and leather products	2
Stone, clay and glass products	1
Primary metal industries	1
Fabricated metal products, except ordnance, machinery and transportation equipment	11
Machinery - except electrical	12
Electrical machinery, equipment and supplies	7
Transportation equipment	3
Miscellaneous manufacturing industries	1
Total number of industries	66

BARRIE

Industrial input - 60%

Domestic input - 40%

Manufacturing Groups	Number of Industries
Food and kindred products	2
Textile mill products	3
Apparel and other finished products made from fabrics and similar materials	1
Paper and allied products	2
Printing, publishing and allied products	6
Chemicals and allied products	1
Rubber and miscellaneous plastic products	8
Leather and leather products	3

Manufacturing Groups	Number of Industries
Stone, clay and glass products	3
Fabricated metal products, except ordnance, machinery and transportation equipment	7
Machinery - except electrical	7
Electrical machinery, equipment and supplies	11
Transportation equipment	1
Professional, scientific and controlling instruments: photographic and optical goods, watches and clocks	2
Miscellaneous manufacturing industries	4
Total number of industries	61

GUELPH

Industrial input - 60%

Domestic input - 40%

Manufacturing Groups	Number of Industries
Food and kindred products	14
Textile mill products	4
Apparel and other finished products	9
Lumber and wood products, except furniture	5
Furniture and fixtures	8
Paper and allied products	10
Printing, publishing and allied products	2
Chemicals and allied products	12
Petroleum refining and related industries	2
Rubber and miscellaneous plastic products	9
Leather and leather products	1
Stone, clay and glass products	12
Primary metal industries	2
Fabricated metal products, except ordnance, machinery and transportation equipment	42
Machinery - except electrical	20
Electrical machinery, equipment and supplies	25
Transportation equipment	7

Manufacturing Groups	Number of Industries
Professional, scientific, and controlling instruments: photographic and optical goods, watches and clocks	21
Miscellaneous manufacturing industries	22
Total number of industries	227

BRANTFORD

Industrial input - 55%

Domestic input - 45%

Manufacturing Groups	Number of Industries
Food and kindred products	13
Textile mill products	4
Apparel and other finished products made from fabrics and similar materials	5
Lumber and wood products, except furniture	5
Furniture and fixtures	2
Paper and allied products	9
Printing, publishing and allied products	7
Chemicals and allied products	8
Rubber and miscellaneous plastic products	12
Stone, clay and glass products	15
Primary metal industries	2
Fabricated metal products, except ordnance, machinery and transportation equipment	28
Machinery - except electrical	27
Electrical machinery, equipment and supplies	14
Transportation equipment	6
Professional, scientific, and controlling instruments: photographic and optical goods, watches and clocks	7
Miscellaneous manufacturing industries	3
Total number of industries	167

PORT WELLER (ST. CATHARINES)

Industrial input - 30%

Domestic input - 70%

Manufacturing Groups	Number of Industries
Food and kindred products	39
Textile mill products	9
Apparel and other finished products	8
Lumber and wood products, except furniture	27
Furniture and fixtures	10
Paper and allied products	17
Printing, publishing and allied products	19
Chemicals and allied products	8
Petroleum refining and related industries	1
Rubber and miscellaneous plastic products	11
Leather and leather products	3
Stone, clay and glass products	21
Primary metal industries	21
Fabricated metal products, except ordnance, machinery and transportation equipment	93
Machinery - except electrical	76
Electrical machinery, equipment and supplies	15
Transportation equipment	13
Professional, scientific, and controlling instruments: photographic and optical goods, watches and clocks	5
Miscellaneous manufacturing industries	12
Total number of industries	408

5.6 Conclusions

Wastewaters from the following industrial groups are most likely to contain metals in varying concentrations: primary metal industries, fabricated metal products, machinery, transportation equipment, chemicals and allied products, leather and leather products [21]. These groups of industries are well represented in the Ontario municipalities that were investigated in conjunction with this report.

Manufacturing Groups		Total Number of Industries in Municipalities Investigated
1.	Food and kindred products	95
2.	Textile mill products	35
3.	Apparel and other finished products	37
4.	Lumber and wood products, except furniture	48
5.	Furniture and fixtures	29
6.	Paper and allied products	52
7.	Printing, publishing and allied products	47
8.	Chemicals and allied products	49
9.	Petroleum refining and related industries	3
10.	Rubber and miscellaneous plastic products	54
11.	Leather and leather products	10
12.	Stone, clay and glass products	67
13.	Primary metal industries	27
14.	Fabricated metal products, except ordnance, machinery and transportation equipment	202
15.	Machinery - except electrical	155
16.	Electrical machinery, equipment and supplies	83
17.	Transportation equipment	40
18.	Professional, scientific, and controlling instruments: photographic and optical goods, watches and clocks	37
19.	Miscellaneous manufacturing industries	45
	Total number of industries	1,115

TABLE 78. SUMMARY OF METAL SOURCES IN INDUSTRIAL AREAS

Municipality	Percent Industrial Source	Percent Domestic Source	Number of Industries in Manufacturing Group Number																			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
LAGOONS																						
Elmvale	0	100	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Markdale	10	90	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Stayner	20	80	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Shelburne	0	100	1	1	0	2	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	7
PRIMARY SEDIMENTATION																						
Prescott	10	90	0	0	3	0	0	2	1	0	0	1	0	0	0	4	0	1	0	0	0	12
Collingwood	60	40	1	2	0	0	1	0	0	1	0	2	0	5	0	0	1	0	2	0	1	16
Midland	80	20	2	1	2	1	1	0	0	1	0	2	0	3	0	7	1	2	0	2	0	25
Owen Sound	60	40	4	0	0	1	0	1	2	1	0	1	0	1	0	2	2	3	2	0	0	20
Cornwall	40	60	4	8	5	1	1	5	2	9	0	2	0	6	0	4	4	2	3	0	0	56
ACTIVATED SLUDGE																						
Burlington	0	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Elmira	60	40	0	2	1	0	1	0	0	3	0	0	0	0	0	1	3	0	0	0	0	11
Fergus	50	50	3	1	0	4	1	1	1	1	0	0	1	0	1	1	1	1	0	0	1	18
Orangeville	30	70	0	0	0	0	0	1	0	2	0	4	0	0	0	1	1	2	3	0	0	14
Stratford	40	60	9	0	2	1	3	4	5	2	0	2	2	1	1	11	12	7	3	0	1	66
Barrie	60	40	2	3	1	0	0	2	6	1	0	8	3	3	0	7	7	11	1	2	4	61
Guelph	60	40	14	4	9	5	8	10	2	12	2	9	1	12	2	42	20	25	7	21	22	227
Brantford	55	45	13	4	5	5	2	9	7	8	0	12	0	15	2	28	27	14	6	7	3	167
Port Weller	30	70	39	9	8	27	10	17	19	8	1	11	3	21	21	93	76	15	13	5	12	408
Lakeview	30	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hamilton	10	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			93	35	37	48	29	52	47	49	3	54	10	67	27	202	155	83	40	37	45	1115

6 ANALYTICAL RESULTS (1975-76 FIELD SEASON)

6.1 Introduction

Unless otherwise indicated, all analytical results in this section are expressed as milligrams per litre (parts per million). Notable exceptions are mercury, which is expressed in parts per billion, and pH which is expressed in standard pH units. All concentrations are "total" concentrations unless otherwise indicated.

The following points should be noted:

(a) The concentrations of ammonia nitrogen, kjeldahl nitrogen, nitrite nitrogen, and nitrate nitrogen are all expressed as N.

(b) Alkalinity is expressed as mg/l of $CaCO_3$.

(c) Chloride is expressed as Cl^-.

(d) Sulphate is Expressed as SO_4

(e) Fluoride is expressed as F.

(f) Phosphate is expressed as P.

(g) All loadings (influent and effluent) are expressed as pounds per day.

(h) All "efficiencies" are expressed as percentages.

(i) 0% efficiency signifies that the concentration of a particular parameter in the effluent from the plant is equivalent to or exceeds the concentration of that parameter entering the plant.

(j) Analysis that was not performed for a particular parameter is expressed as a dashed line.

(k) All flows quoted are expressed as million gallons per day (mgd).

All analytical results quoted in this section are based on four-hour composite samples. Standard techniques for the preservation of metals etc., were consistently adhered to during the course of the study.

6.2 Lagoons - Single Cell Installations

Analytical results for Elmvale and Markdale are given on the following pages.

(a) MUNICIPALITY: Elmvale
POPULATION SERVED: 1,220
DATE OF SAMPLING: June 30, 1976
FLOW: .18 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	-	-	-	-	-
Ammonia	27	49	8	14	70%
Kjeldahl	35	63	10	18	71%
Nitrite	-	-	-	-	-
Nitrate	-	-	-	-	-
BOD	55	99	12	22	78%
COD	120	216	42	76	65%
Susp. Solids	170	306	25	45	85%
Diss. Solids	605	1,089	520	936	14%
Total Solids	775	1,395	545	981	30%
Chloride	90	162	55	99	39%
Sulphate	85	153	49	88	42%
Fluoride	.35	.63	.15	.27	57%
Phosphate	5.0	9.0	2.0	3.6	60%
pH	7.2	-	7.2	-	-
K	12	22	5	9.0	58%
Na	50	90	36	65	28%
Zn	.03	.05	.02	.04	33%
Cu	<.01	<.02	<.01	<.02	0%
Ni	.02	.04	<.01	<.02	50%
Pb	<.01	<.02	<.01	<.02	0%
Cd	<.01	<.02	<.01	<.02	0%
Cr	.01	.02	.01	.02	0%
Al	.06	.11	.04	.07	33%
Mn	<.01	<.02	<.01	<.02	0%
Fe	.20	.36	<.06	.11	70%
Ca	64	115	60	108	6.3%
Mg	13	23	15	27	0%
Ti	.02	.04	.01	.02	50%
Li	<.02	<.04	<.01	<.02	50%
Co	<.01	<.02	<.01	<.02	0%
Hg(ppb)	.08		.05		38%
Sn	<.20	.36	.10	.18	50%
V	.02	.04	<.01	<.02	50%
As	.002	.004	<.001	.002	50%
Ba	.06	.11	.04	.07	66%
Sr	.30	.54	.28	.50	6.7%
Mo	<.01	<.02	<.01	<.02	0%
Ag	<.01	<.02	<.01	<.02	0%
Se	<.001	<.002	<.001	<.002	0%

(b) MUNICIPALITY: Markdale
POPULATION SERVED: 1,320
DATE OF SAMPLING: July 14, 1976
FLOW: .26 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	-	-	-	-	-
Ammonia	20	52	3.0	7.8	85%
Kjeldahl	55	143	7.0	18	87%
Nitrite	-	-	-	-	-
Nitrate	-	-	-	-	-
BOD	250	650	20	52	92%
COD	100	260	25	65	75%
Susp. Solids	260	676	65	169	75%
Diss. Solids	545	1417	503	1308	7.7%
Total Solids	805	2093	-	-	-
Chloride	85	221	64	166	25%
Sulphate	80	208	81	211	0%
Fluoride	.30	.78	.10	.26	67%
Phosphate	7.0	18	1.5	3.9	79%
pH	7.4	-	7.3	-	-
K	10	26	7.0	18	30%
Na	45	117	32	83	29%
Zn	.05	.13	.03	.08	40%
Cu	<.01	<.03	<.01	<.03	0%
Ni	.04	.10	.03	.08	25%
Pb	<.01	<.03	<.01	<.03	0%
Cd	<.01	<.03	<.01	<.03	0%
Cr	<.02	<.05	<.01	<.03	50%
Al	.10	.26	.08	.21	20%
Mn	.03	.08	<.01	<.03	67%
Fe	.15	.39	<.05	<.13	67%
Ca	67	174	64	166	4.5%
Mg	17	44	18	47	0%
Ti	<.01	<.03	<.01	<.03	0%
Li	<.01	<.03	<.01	<.03	0%
Co	<.01	<.03	<.01	<.03	0%
Hg(ppb)	.18		<.03		83%
Sn	.40	1.0	.15	.39	63%
V	<.01	<.03	<.01	<.03	0%
As	<.001	<.003	<.001	<.003	0%
Ba	.06	.16	.03	.08	50%
Sr	.17	.44	.19	.49	0%
Mo	<.01	<.03	<.01	<.03	0%
Ag	<.01	<.03	<.01	<.03	0%
Se	<.001	<.003	<.001	<.003	0%

6.3 Lagoons - Multi-cell Installations

Analytical results for Stayner and Shelburne are given on the following pages.

(a) MUNICIPALITY: Stayner
POPULATION SERVED: 2,256
DATE OF SAMPLING: June 29, 1976
FLOW: .098 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	-	-	-	-	-
Ammonia	22	22	5.0	4.9	77%
Kjeldahl	29	28	4.0	3.9	86%
Nitrite	-	-	-	-	-
Nitrate	-	-	-	-	-
BOD	60	59	10	9.8	83%
COD	135	132	60	59	56%
Susp. Solids	185	181	30	29	84%
Diss. Solids	682	668	601	589	12%
Total Solids	867	849	631	618	27%
Chloride	95	93	62	61	35%
Sulphate	90	88	45	44	50%
Fluoride	.30	.29	.14	.14	53%
Phosphate	4.7	4.6	1.9	1.9	60%
pH	7.6	-	7.6	-	-
K	10	9.8	4.2	4.1	58%
Na	47	46	32	31	32%
Zn	.08	<.08	.03	<.03	63%
Cu	.02	.02	.01	<.01	50%
Ni	.03	<.03	.02	<.02	33%
Pb	<.01	<.01	<.01	<.01	0%
Cd	<.01	<.01	<.01	<.01	0%
Cr	.02	<.02	.02	<.02	0%
Al	.08	<.08	.02	<.02	75%
Mn	<.03	<.03	<.01	<.01	67%
Fe	.15	<.15	<.04	<.04	73%
Ca	54	53	48	47	11%
Mg	14	<14	15	<15	0%
Ti	.03	<.03	<.01	<.01	67%
Li	.02	<.02	<.01	<.01	50%
Co	<.01	<.01	<.01	<.01	0%
Hg(ppb)	.08		<.02		75%
Sn	.42	.41	.18	<.18	57%
V	<.01	<.01	<.01	<.01	0%
As	<.001	<.001	<.001	<.001	0%
Ba	.03	<.03	.01	<.01	67%
Sr	.16	.16	.14	.14	13%
Mo	<.01	<.01	<.01	<.01	0%
Ag	<.01	<.01	<.01	<.01	0%
Se	<.001	<.001	<.001	<.001	0%

(b) MUNICIPALITY: Shelburne
POPULATION SERVED: 2,919
DATE OF SAMPLING: July 15, 1976
FLOW: .42 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	-	-	-	-	-
Ammonia	20	84	7	29	65%
Kjeldahl	27	113	10	42	63%
Nitrite	-	-	-	-	-
Nitrate	-	-	-	-	-
BOD	75	315	18	76	76%
COD	125	525	40	168	68%
Susp. Solids	90	378	.25	1.1	98%
Diss. Solids	590	2478	480	2016	19%
Total Solids	680	2856	505	2121	26%
Chloride	95	399	55	231	42%
Sulphate	88	370	36	151	59%
Fluoride	.45	1.9	.18	.76	60%
Phosphate	8.0	34	4.0	17	50%
pH	7.7	-	7.7	-	-
K	11	46	6	25	46%
Na	52	218	31	130	40%
Zn	.06	.25	.04	.17	33%
Cu	.03	.13	<.01	<.04	67%
Ni	.05	.21	.02	.08	60%
Pb	<.01	<.04	<.01	<.04	0%
Cd	<.01	<.04	<.01	<.04	0%
Cr	<.02	<.08	<.02	<.08	0%
Al	.09	<.38	.05	.21	44%
Mn	<.02	<.08	<.01	<.04	50%
Fe	<.21	<.88	.08	.34	62%
Ca	84	353	87	365	0%
Mg	20	84	21	88	0%
Ti	.04	.17	.06	.25	0%
Li	.01	.04	<.01	<.04	0%
Co	<.01	<.04	<.01	<.04	0%
Hg(ppb)	.15		.10		33%
Sn	.60	2.5	.15	.63	75%
V	<.02	<.08	<.02	<.08	0%
As	.003	.01	<.001	<.004	67%
Ba	.04	.17	.02	.08	50%
Sr	.41	1.7	.38	1.6	7.3%
Mo	<.01	.04	<.01	<.04	0%
Ag	<.01	<.04	<.01	<.04	0%
Se	<.001	<.004	<.001	<.004	0%

6.4 Primary Treatment Plants

Analytical results for municipalities with primary treatment are given on the following pages.

(a) MUNICIPALITY: Prescott
POPULATION SERVED: 5,200
DATE OF SAMPLING: July 28, 1976
FLOW: .82 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	300	2469	315	2583	0%
Ammonia N	10	82	4.0	33	60%
Kjeldahl N	15	123	6.0	49	60%
Nitrite	.21	1.7	.18	1.5	14%
Nitrate	<.20	<1.7	3.0	25	0%
BOD	80	656	37	303	54%
COD	180	1476	30	246	83%
Susp. Solids	150	1230	46	377	69%
Diss. Solids	901	7388	502	4116	43%
Total Solids	1051	8618	548	4494	48%
Chloride	119	976	120	984	0%
Sulphate	48	394	48	394	0%
Fluoride	.60	4.9	.30	2.5	50%
Phosphate	2.0	16	.70	3.7	65%
pH	6.4	-	6.5	-	-
K	3.0	25	2.4	20	20%
Na	50	410	23	189	54%
Zn	-	-	-	-	-
Cu	-	-	-	-	-
Ni	-	-	-	-	-
Pb	-	-	-	-	-
Cd	-	-	-	-	-
Cr	-	-	-	-	-
Al	-	-	-	-	-
Mn	-	-	-	-	-
Fe	-	-	-	-	-
Ca	120	984	110	902	8%
Mg	35	287	30	246	14%
Ti	-	-	-	-	-
Li	-	-	-	-	-
Co	-	-	-	-	-
Hg(ppb)	-	-	-	-	-
Sn	-	-	-	-	-
V	-	-	-	-	-
As	.004	.03	.001	.008	75%
Ba	-	-	-	-	-
Sr	-	-	-	-	-
Mo	-	-	-	-	-
Ag	-	-	-	-	-
Se	<.003	.03	<.001	.008	67%

(b) MUNICIPALITY: Collingwood
POPULATION SERVED: 8,500
DATE OF SAMPLING: June 29, 1976
FLOW: 2.0 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	226	4520	186	3720	18%
Ammonia	11	220	5.4	108	51%
Kjeldahl	17	340	26	520	0%
Nitrite	<.01	<.20	.08	1.6	0%
Nitrate	.20	4.0	11	220	0%
BOD	24	480	11	220	54%
COD	85	1700	50	1000	41%
Susp. Solids	43	860	23	460	47%
Diss. Solids	504	10080	494	9880	2.0%
Total Solids	547	10940	517	10340	5.5%
Chloride	130	2600	109	2180	16%
Sulphate	48	960	42	840	13%
Fluoride	.20	4.0	10	200	0%
Phosphate	3.5	70	1.2	24	66%
pH	7.6	-	7.6	-	0%
K	5.8	116	5.6	112	3.5%
Na	69	1380	42	840	39%
Zn	.06	1.2	.38	7.6	0%
Cu	.05	1.0	.04	.80	20%
Ni	.02	.40	.02	.40	0%
Pb	.04	.80	.04	.80	0%
Cd	<.01	<.20	<.01	<.20	0%
Cr	.04	.80	.03	.60	25%
Al	.16	3.2	<.02	<.40	88%
Mn	.06	1.2	.13	2.6	0%
Fe	.65	13	4.0	80	0%
Ca	260	5200	240	4800	8%
Mg	12	240	14	280	0%
Ti	<.10	<2.0	<.10	<2.0	0%
Li	<.01	<.20	<.01	<.20	0%
Co	<.01	<.20	<.01	<.20	0%
Hg(ppb)	.09		.06		33%
Sn	.30	6.0	1.6	32	0%
V	.01	.20	.01	.20	0%
As	.002	.04	<.001	<.02	50%
Ba	.04	.80	.03	.60	25%
Sr	.30	6.0	.31	6.2	0%
Mo	<.01	<.20	.02	.40	0%
Ag	<.01	<.20	<.01	<.20	0%
Se	<.001	<.02	<.001	<.02	0%

(c) MUNICIPALITY: Midland
POPULATION SERVED: 10,500
DATE OF SAMPLING: May 17, 1976
FLOW: 1.5 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	255	3825	284	4260	0%
Ammonia	5.7	86	7.6	114	0%
Kjeldahl	17	255	17	255	0%
Nitrite	.28	4.2	.19	2.9	32%
Nitrate	6.8	102	3.0	45	56%
BOD	70	1050	22	330	69%
COD	155	2325	81	1215	48%
Susp. Solids	256	3840	59	885	77%
Diss. Solids	864	12960	528	7920	39%
Total Solids	1120	16800	587	8805	48%
Chloride	117	1755	117	1755	0%
Sulphate	130	1950	55	825	58%
Fluoride	1.0	15	.30	4.5	70%
Phosphate	76	1140	1.2	18	98%
pH	7.8	-	11.8	-	-
K	7.3	110	8.4	126	0%
Na	210	3150	63	945	70%
Zn	.75	11	<.01	<.15	99%
Cu	.02	.30	.03	.45	0%
Ni	.21	3.2	.22	3.3	0%
Pb	.14	2.1	<.01	.15	93%
Cd	<.01	<.15	<.01	.15	0%
Cr	1.2	18	.33	5.0	73%
Al	12	180	.19	2.9	98%
Mn	.08	1.2	.01	.15	88%
Fe	6.4	96	.20	3.0	97%
Ca	64	960	60	900	6.3%
Mg	17	255	1.6	24	90%
Ti	<.10	<1.5	<.10	<1.5	0%
Li	.02	.30	<.01	<.15	0%
Co	<.01	<.15	<.01	<.15	0%
Hg(ppb)	.52		.08		85%
Sn	.30	4.5	.10	1.5	67%
V	<.01	<.15	<.01	<.15	0%
As	.02	.30	<.001	<.02	95%
Ba	.23	3.5	.03	.45	87%
Sr	.23	3.5	.17	2.6	26%
Mo	.02	.30	<.01	<.15	50%
Ag	<.01	1.5	<.01	.15	0%
Se	<.001	.02	<.001	<.02	0%

(d) MUNICIPALITY: Owen Sound
POPULATION SERVED: 17,750
DATE OF SAMPLING: May 27, 1976
FLOW: 3.3 mgd

Parameter	Influent	Influent Loading	Sludge	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	294	9702	17900	244	8052	17%
Ammonia	14	462	760	8.5	281	39%
Kjeldahl	19	627	3600	20	660	0%
Nitrite	.10	3.3	-	.16	5.3	0%
Nitrate	<.10	3.3	-	1.6	53	0%
BOD	40	1320	-	21	693	48%
COD	160	5280	-	44	1452	73%
Susp. Solids	215	7095	-	29	957	87%
Diss. Solids	556	18348	-	616	20328	0%
Total Solids	771	25443	254000	645	21285	16%
Chloride	107	3531	-	141	4653	0%
Sulphate	64	2112	53	58	1914	9.4%
Fluoride	.60	20	-	.50	17	17%
Phosphate	3.4	112	1000	1.5	50	56%
pH	7.8	-	7.6	7.8	-	-
K	7.8	257	41	7.4	244	5.1%
Na	87	2871	84	84	2772	3.5%
Zn	.15	5.0	650	.26	8.6	0%
Cu	.10	3.3	.20	.05	1.7	50%
Ni	<.01	<.33	4.6	<.01	<.33	0%
Pb	.02	.66	330	.02	.66	0%
Cd	<.01	<.33	215	<.01	<.33	0%
Cr	.35	12	.07	<.01	<.33	97%
Al	2.6	86	160	.42	14	84%
Mn	.06	2.0	4.6	.10	3.3	0%
Fe	1.1	36	25000	2.8	92	0%
Ca	58	1914	33000	72	2376	0%
Mg	2.1	693	3700	2.1	693	0%
Ti	.20	6.6	510	<.10	<.33	50%
Li	<.01	.33	1.9	<.01	<.33	0%
Co	<.01	.33	.67	<.01	<.33	0%
Hg(ppb)	.08		210	<.05		38%
Sn	<.20	6.6	33	<.20	6.6	0%
V	<.01	.33	8.9	<.01	.33	0%
As	<.001	<.03	2.4	.001	.03	0%
Ba	.04	1.3	40	.05	1.7	0%
Sr	.22	7.3	32	.21	6.9	4.6%
Mo	<.01	<.33	2.1	.02	.66	0%
Ag	<.01	<.33	9.6	<.01	<.33	0%
Se	<.001	<.03	<.001	<.001	<.03	0%

(e) MUNICIPALITY: Cornwall
POPULATION SERVED: 42,500
DATE OF SAMPLING: July 30, 1976
FLOW: 7.61 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	100	7610	175	13318	0%
Ammonia	10	761	3.0	228	70%
Kjeldahl	15	1142	8	609	47%
Nitrite	.20	15	.18	.14	10%
Nitrate	.11	8.4	.15	11	0%
BOD	180	13698	75	5708	58%
COD	600	45660	50	3805	92%
Susp. Solids	180	13698	42	3196	77%
Diss. Solids	1200	91320	600	45660	50%
Total Solids	1380	105018	642	48856	54%
Chloride	100	7610	110	8371	0%
Sulphate	200	15220	100	7610	50%
Fluoride	35	2664	-	-	-
Phosphate	10	761	3.2	244	68%
pH	7.4	-	7.5	-	-
Zn	.50	38	.15	11	70%
Cu	.40	30	.20	15	50%
Ni	.30	23	.05	3.8	83%
Pb	.80	61	.02	1.5	98%
Cd	.02	1.5	<.01	.76	50%
Cr	1.0	76	.20	15	80%
Al	-	-	1.5	114	-
Mn	-	-	.05	3.8	-
Fe	2.0	152	.20	15	90%
Ca	35	2664	110	8371	0%
Mg	-	-	-	-	-
Ti	.05	3.8	<.10	.76	0%
Li	<.01	.76	<.01	.76	0%
Co	<.01	.76	<.01	.76	0%
Hg(ppb)	-	-	-	-	-
Sn	.40	30	1.0	76	0%
V	<.01	.76	<.01	.76	0%
As	<.001	.08	<.001	.08	0%
Ba	.30	23	.02	1.5	93%
Sr	.12	9.1	.08	6.1	33%
Mo	<.01	<.76	<.01	<.76	0%
Ag	<.01	<.76	<.01	<.76	0%
Se	<.001	<.08	<.001	<.08	0%

6.5 Activated Sludge Plants

Analytical results for municipalities with activated sludge plants are given on the following pages.

(a) MUNICIPALITY: Burlington - Elizabeth Gardens Plant
POPULATION SERVED: 4,500
DATE OF SAMPLING: February 20/76, April 27/76
FLOW: .99 mgd

Parameter	Influent	Influent Loading	Sludge	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	0	0	551	186	1841	0%
Ammonia	31	307	21	4	40	87%
Kjeldahl	43	426	210	1.4	14	97%
Nitrite	1.0	9.9	.03	.12	1.2	88%
Nitrate	.60	5.9	<.10	12	119	0%
BOD	45	446	1800	6.0	59	87%
COD	175	1733	3090	17	168	90%
Susp. Solids	60	594	2350	<15	<149	75%
Diss. Solids	690	6831	620	615	6089	11%
Total Solids	750	7425	2970	630	6237	16%
Chloride	155	1535	43	109	1079	30%
Sulphate	92	911	7	93	921	0%
Fluoride	.60	5.9	-	.40	4.0	33%
Phosphate	9.0	89	46	20	198	0%
pH	7.6	-	6.7	7.6	-	-
K	14	139	20	7.5	74	46%
Na	110	1089	58	57	564	48%
Zn	.04	.40	1.2	.03	.30	25%
Cu	.08	.80	2.2	.02	.20	75%
Ni	.01	.10	<.20	<.01	<.10	0%
Pb	<.01	<.10	.60	<.01	<.10	0%
Cd	<.01	<.10	<.01	<.01	<.10	0%
Cr	<.02	<.20	<.04	<.04	<.40	0%
Al	.19	1.9	27	<.03	<.30	84%
Mn	.04	.40	.70	.03	.30	25%
Fe	.20	2.0	10	<.05	<.50	75%
Ca	91	901	190	88	871	3%
Mg	21	208	45	22	218	0%
Ti	<.05	<.50	<.10	<.10	<.99	0%
Li	.02	.20	<.10	.01	.10	50%
Co	<.01	<.10	<.20	<.01	<.10	0%
Hg(ppb)	.36		4.3	<.03		92%
Sn	.89	8.8	<1.5	.30	3.0	66%
V	.02	.20	.35	<.01	<.10	50%
As	.003	.03	.008	<.001	<.01	67%
Ba	.05	.50	1.0	.08	.80	0%
Sr	.45	4.5	1.2	.96	9.5	0%
Mo	-	-	-	-	-	-
Ag	-	-	-	-	-	-
Se	-	-	-	-	-	-

(b) MUNICIPALITY: Elmira
POPULATION SERVED: 4,820
DATE OF SAMPLING: Aug. 23, 1976
FLOW: .52 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	407	2116	211	1097	48%
Ammonia	30	156	2.2	11	93%
Kjeldahl	46	239	6.5	34	86%
Nitrite	.01	.05	.45	2.3	0%
Nitrate	.60	3.1	20	104	0%
BOD	170	884	7.0	36	96%
COD	422	2194	104	541	75%
Susp. Solids	170	884	30	156	82%
Diss. Solids	3950	20540	3930	20436	.50%
Total Solids	4120	21424	3960	20592	4%
Chloride	1130	5876	1150	5980	0%
Sulphate	1200	6240	1200	6240	0%
Fluoride	.80	4.2	.70	3.6	13%
Phosphate	7.4	39	4.7	24	37%
pH	7.4	-	7.6	-	0%
K	13	68	12	62	8%
Na	1190	6188	1190	6188	0%
Zn	-	-	-	-	-
Cu	-	-	-	-	-
Ni	-	-	-	-	-
Pb	-	-	-	-	-
Cd	-	-	-	-	-
Cr	-	-	-	-	-
Al	-	-	-	-	-
Mn	-	-	-	-	-
Fe	-	-	-	-	-
Ca	110	572	120	624	0%
Mg	32	166	33	172	0%
Ti	-	-	-	-	-
Li	-	-	-	-	-
Co	-	-	-	-	-
Hg(ppb)	-	-	-	-	-
Sn	-	-	-	-	-
V	-	-	-	-	-
As	.005	.03	.002	.01	60%
Ba	-	-	-	-	-
Sr	-	-	-	-	-
Mo	-	-	-	-	-
Ag	-	-	-	-	-
Se	.014	.07	.006	.03	57%

(c) MUNICIPALITY: Fergus
POPULATION SERVED: 5,600
DATE OF SAMPLING: March 23, 1976
April 15, 1976
FLOW: .90 mgd

Parameter	Influent	Influent Loading	Sludge	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	241	2169	8390	242	2178	0%
Ammonia	10	90	710	2.0	18	80%
Kjeldahl	17	153	2000	4.2	38	75%
Nitrite	.02	.18	1.0	.18	1.6	0%
Nitrate	<.20	<1.8	<.10	6.6	5.9	0%
BOD	50	450	4700	7.0	63	86%
COD	195	1755	15900	40	360	80%
Susp. Solids	190	1710	-	26	234	86%
Diss. Solids	1060	9540	-	698	6282	34%
Total Solids	1250	11250	102000	724	6516	42%
Chloride	235	2115	2268	172	1548	27%
Sulphate	310	2790	10	130	1170	58%
Fluoride	.50	4.5	-	.20	1.8	60%
Phosphate	3.8	34	1300	.84	7.6	78%
pH	-	-	6.9	7.7	-	-
K	1.7	15	87	4.3	38.7	0%
Na	37	333	170	99	891	0%
Zn	4.5	41	80	2.6	23	42%
Cu	1.7	15	87	4.3	39	0%
Ni	.06	.54	.84	<.01	<.09	83%
Pb	.09	.81	1.1	<.01	<.09	89%
Cd	<.01	<.09	.05	<.01	<.09	0%
Cr	-	-	18	.12	1.1	-
Al	1.9	17	20	<.06	<.54	97%
Mn	.15	1.4	1.5	.04	.36	73%
Fe	4.3	39	620	3.1	28	28%
Ca	130	1170	260	110	990	15%
Mg	37	333	65	31	279	16%
Ti	-	-	<.10	<.10	.90	-
Li	.01	.09	<.01	<.01	<.09	0%
Co	<.01	<.09	.02	<.01	<.09	0%
Hg(ppb)	.26		14	.05		81%
Sn	<.20	<1.8	.60	.20	1.8	0%
V	.02	.18	.03	<.01	<.09	50%
As	.003	.03	.64	<.001	<.01	67%
Ba	.26	2.3	4.5	.03	.27	89%
Sr	2.0	18	3.2	1.0	9	50%
Mo	<.01	<.09	-	-	-	-
Ag	<.01	<.09	-	-	-	-
Se	<.001	<.01	-	-	-	-

(d) MUNICIPALITY: Orangeville
POPULATION SERVED: 10,000
DATE OF SAMPLING: August 24, 1976
FLOW: .60 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	426	2556	250	1500	41%
Ammonia	36	216	2.5	15	93%
Kjeldahl	49	294	3.0	18	94%
Nitrite	.01	.06	.23	1.4	0%
Nitrate	.20	1.2	10	60	0%
BOD	130	780	3.0	18	98%
COD	307	1842	30	180	90%
Susp. Solids	160	960	<5.0	<30	97%
Diss. Solids	820	4920	870	5220	0%
Total Solids	980	5880	875	5250	11%
Chloride	186	1116	137	822	26%
Sulphate	96	576	100	600	0%
Fluoride	.80	4.8	.20	1.2	75%
Phosphate	7.6	46	1.3	7.8	83%
pH	7.0	-	7.9	-	-
K	12	72	9.4	5.6	22%
Na	130	-	110	660	15%
Zn	-	-	-	-	-
Cu	-	-	-	-	-
Ni	-	-	-	-	-
Pb	-	-	-	-	-
Cd	-	-	-	-	-
Cr	-	-	-	-	-
Al	-	-	-	-	-
Mn	-	-	-	-	-
Fe	-	-	-	-	-
Ca	96	576	89	534	7%
Mg	26	156	24	144	8%
Ti	-	-	-	-	-
Li	-	-	-	-	-
Co	-	-	-	-	-
Hg(ppb)	.13		.03		77%
Sn	-	-	-	-	-
V	-	-	-	-	-
As	.003	.02	.001	.006	67%
Ba	-	-	-	-	-
Sr	-	-	-	-	-
Mo	-	-	-	-	-
Ag	-	-	-	-	-
Se	.002	.01	<.001	<.006	50%

(e) MUNICIPALITY: Stratford
POPULATION SERVED: 28,000
DATE OF SAMPLING: August 20, 1976
FLOW: 4.2 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	353	14826	213	8946	40%
Ammonia	16	672	2.6	109	84%
Kjeldahl	28	1176	2.8	118	90%
Nitrite	.01	.42	1.1	46	0%
Nitrate	.10	4.2	11	462	0%
BOD	240	10080	2.0	84	99%
COD	854	35868	30	1260	97%
Susp. Solids	395	16590	<5.0	210	99%
Diss. Solids	1040	43680	1230	51660	0%
Total Solids	1435	60270	1235	51870	14%
Chloride	85	3570	160	6720	-
Sulphate	360	15120	400	16800	-
Fluoride	2.3	97	1.9	80	17%
Phosphate	6.6	277	.24	10	96%
pH	7.0	-	7.2	-	0%
K	11	462	11	462	0%
Na	120	5040	160	6720	0%
Zn	-	-	-	-	-
Cu	-	-	-	-	-
Ni	-	-	-	-	-
Pb	-	-	-	-	-
Cd	-	-	-	-	-
Cr	-	-	-	-	-
Al	-	-	-	-	-
Mn	-	-	-	-	-
Fe	-	-	-	-	-
Ca	140	5880	120	5040	14%
Mg	34	1428	36	1512	0%
Ti	-	-	-	-	-
Li	-	-	-	-	-
Co	-	-	-	-	-
Hg(ppb)	.10		<.03		70%
Sn	-	-	-	-	-
V	-	-	-	-	-
As	.006	.25	<.001	<.04	83%
Ba	-	-	-	-	-
Sr	-	-	-	-	-
Mo	-	-	-	-	-
Ag	-	-	-	-	-
Se	.004	.17	<.001	<.04	75%

(f) MUNICIPALITY: Barrie
POPULATION SERVED: 31,390
DATE OF SAMPLING: May 18, 1976
FLOW: 5.0 mgd

Parameter	Influent	Influent Loading	Sludge	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	66	3300	61	209	10450	0%
Ammonia	39	1950	590	1.4	70	96%
Kjeldahl	50	2500	1700	2.6	130	95%
Nitrite	.42	21	-	.16	8.0	62%
Nitrate	.10	5.0	-	12	600	0%
BOD	160	8000	-	5.0	250	97%
COD	505	25250	-	44	2200	91%
Susp. Solids	200	10000	-	12	600	94%
Diss. Solids	1160	58000	-	732	36600	37%
Total Solids	1360	68000	24300	744	37200	45%
Chloride	273	13650	564	-	-	-
Sulphate	180	9000	37	120	6000	33%
Fluoride	.30	15	-	.30	15	0%
Phosphate	7.4	370	700	.80	40	89%
pH	7.8	-	7.7	7.9	-	0%
K	10	500	67	8.6	430	14%
Na	260	13000	210	140	7000	46%
Zn	.43	22	1.2	.13	6.5	70%
Cu	.24	12	17	.16	8.0	33%
Ni	.08	4.0	11	.23	12	0%
Pb	.08	4.0	9.1	.02	1.0	75%
Cd	<.01	<.50	.02	<.01	<.50	0%
Cr	7.9	395	300	.17	8.5	98%
Al	1.3	65	850	1.4	70	0%
Mn	.21	11	9.9	.05	2.5	76%
Fe	1.6	80	250	.11	5.5	93%
Ca	41	2050	1100	71	3550	0%
Mg	15	750	120	15	750	0%
Ti	.06	3.0	42	<.20	<10	0%
Li	<.01	<.50	<.10	<.01	<.50	0%
Co	<.01	<.50	<.01	<.01	<.50	0%
Hg(ppb)	.28		29	.05		82%
Sn	.50	25	4.0	1.1	55	0%
V	<.02	<1.0	<.20	<.02	<1.0	0%
As	<.001	<.05	.08	<.001	<.05	0%
Ba	.54	27	23	.02	1.0	96%
Sr	.26	13	5.1	.23	12	12%
Mo	.02	1.0	.30	.03	1.5	0%
Ag	<.01	<.50	.50	<.10	5.0	0%
Se	<.001	<.05	<.001	<.001	<.05	0%

(g) MUNICIPALITY: Guelph
POPULATION SERVED: 63,000
DATE OF SAMPLING: February 6, 1976
March 23, 1976
FLOW: 9.8 mgd

Parameter	Influent	Influent Loading	Sludge	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	0	0	8708	268	26264	0%
Ammonia	25	2450	440	6.5	637	74%
Kjeldahl	34	3332	1800	8.6	843	75%
Nitrite	<.02	<2.0	.10	.25	25	0%
Nitrate	<.20	<20	.40	4.0	392	0%
BOD	120	11760	3700	7.0	686	94%
COD	327	32046	44100	73	7154	78%
Susp. Solids	160	15680	-	31	3038	81%
Diss. Solids	905	88690	-	948	92904	0%
Total Solids	1065	104370	51000	979	95942	8%
Chloride	189	18522	996	261	25578	0%
Sulphate	150	14700	5	29	2842	81%
Fluoride	.60	59	-	.60	59	0%
Phosphate	5.2	510	2200	1.1	108	79%
pH	-	-	7.1	7.6	-	-
K	40	3920	40	6.5	637	84%
Na	160	15600	160	170	16660	0%
Zn	.88	86	14	.27	27	69%
Cu	.61	60	7.3	.10	9.8	84%
Ni	.14	14	.22	.04	3.9	71%
Pb	.08	7.8	3.7	.03	2.9	63%
Cd	.01	.98	.45	<.01	<.98	0%
Cr	-	-	5.2	.24	24	-
Al	-	-	710	2.2	216	-
Mn	.05	4.9	.52	.05	4.9	0%
Fe	2.2	216	67	.72	71	67%
Ca	93	9114	180	110	10780	0%
Mg	31	3038	25	35	3430	0%
Ti	-	-	.30	<.10	<9.8	-
Li	.01	.98	<.01	<.01	<.98	0%
Co	<.01	<.98	.02	<.01	<.98	0%
Hg(ppb)	.16		6.7	.11		31%
Sn	<.20	<20	.80	.20	20	0%
V	.02	2.0	.04	<.01	<.98	50%
As	.003	.30	.70	<.001	<.10	67%
Ba	.15	15	2.2	.02	2.0	87%
Sr	1.8	176	3.5	1.1	108	39%
Mo	.02	2.0	-	-	-	-
Ag	<.01	<.98	-	-	-	-
Se	<.001	<.10	-	-	-	-

(h) MUNICIPALITY Brantford
POPULATION SERVED: 65,124
DATE OF SAMPLING: August 19, 1976
FLOW: 10.1 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	267	26967	204	20604	24%
Ammonia	8.6	869	1.5	152	83%
Kjeldahl	25	2525	3.8	384	85%
Nitrite	.01	1.0	.23	23	0%
Nitrate	.10	10	4.2	424	0%
BOD	200	20200	6.0	606	97%
COD	505	51005	63	6363	88%
Susp. Solids	168	16968	21	2121	88%
Diss. Solids	642	64842	702	70902	0%
Total Solids	810	81810	723	73023	11%
Chloride	78	7878	118	11918	0%
Sulphate	140	14140	110	11110	21%
Fluoride	1.0	101	.90	91	10%
Phosphate	7.2	727	.90	91	88%
pH	7.2	727	7.6	768	0%
K	12	1212	8.8	889	27%
Na	77	7777	80	8080	0%
Zn	-	-	-	-	-
Cu	-	-	-	-	-
Ni	-	-	-	-	-
Pb	-	-	-	-	-
Cd	-	-	-	-	-
Cr	-	-	-	-	-
Al	-	-	-	-	-
Mn	-	-	-	-	-
Fe	-	-	-	-	-
Ca	82	8282	83	8383	0%
Mg	21	2121	22	2222	0%
Ti	-	-	-	-	-
Li	-	-	-	-	-
Co	-	-	-	-	-
Hg(ppb)	.11		.05		55%
Sn	-	-	-	-	-
V	-	-	-	-	-
As	.003	.30	<.001	<.10	67%
Ba	-	-	-	-	-
Sr	-	-	-	-	-
Mo	-	-	-	-	-
Ag	-	-	-	-	-
Se	.014	1.4	<.001	<.10	93%

(i) MUNICIPALITY: Port Weller
POPULATION SERVED: 71,520
DATE OF SAMPLING: May 12, 1976
FLOW: 7.95 mgd

Parameter	Influent	Influent Loading	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	0	-	0	-	0%
Ammonia	45	3578	1.8	143	96%
Kjeldahl	69	5486	1.8	143	97%
Nitrite	.02	1.6	2.3	183	0%
Nitrate	.20	16	11	875	0%
BOD	120	9540	6.0	477	95%
COD	920	73140	-	-	-
Susp. Solids	1812	144054	8	636	100%
Diss. Solids	604	48018	662	52629	0%
Total Solids	2416	192072	670	53265	72%
Chloride	114	9063	83	6599	27%
Sulphate	130	10335	1.7	135	99%
Fluoride	.30	24	.10	8.0	67%
Phosphate	37	2942	.36	29	99%
pH	8.3	-	8.7	-	-
K	9.8	779	6.9	549	30%
Na	-	-	-	-	-
Zn	.78	62	.06	4.8	92%
Cu	.21	17	<.01	<.80	95%
Ni	.07	5.6	.03	2.4	57%
Pb	.06	4.8	<.01	<.80	83%
Cd	.15	12	<.01	<.80	93%
Cr	.64	51	.04	3.2	94%
Al	5.9	469	.50	40	92%
Mn	.15	12	.08	6.4	47%
Fe	5.6	445	.20	16	96%
Ca	100	7950	95	7553	5%
Mg	15	1193	31	2465	0%
Ti	<.10	<8.0	.10	8.0	0%
Li	.01	.80	<.01	<.80	0%
Co	<.01	<.80	<.01	<.80	0%
Hg(ppb)	.50		<.05		90%
Sn	<.20	<16	<.20	<16	0%
V	<.01	<.80	<.01	<.80	0%
As	<.001	<.08	.005	.40	0%
Ba	.12	9.5	<.01	<.80	92%
Sr	.31	25	.53	42	0%
Mo	<.01	<.80	<.01	<.80	0%
Ag	.02	1.6	<.01	<.80	50%
Se	.002	.16	.003	.24	0%

(j) MUNICIPALITY South Peel - Lakeview Plant
POPULATION SERVED: 200,000
DATE OF SAMPLING: January 28, 1976
April 15, 1976
FLOW: 37.5 mgd

Parameter	Influent	Influent Loading	Sludge	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	0	0	5484	247	92625	0%
Ammonia	20	7500	680	16	6000	20%
Kjeldahl	33	12375	2000	18	6750	46%
Nitrite	.02	7.5	.40	.66	248	0%
Nitrate	<.20	<75	.60	3.0	1125	0%
BOD	125	46875	2350	23	8625	82%
COD	580	217500	28100	88	33000	85%
Susp. Solids	200	75000	-	9	3375	96%
Diss. Solids	680	255000	-	704	264000	0%
Total Solids	880	330000	26800	713	267375	19%
Chloride	944	354000	527	159	59625	83%
Sulphate	83	31125	65	113	42375	0%
Fluoride	1.2	450	-	.20	75	83%
Phosphate	11	4125	1100	.32	120	97%
pH	7.2	-	7.2	7.4	-	-
K	25	9375	130	.32	120	99%
Na	130	48750	120	100	37500	23%
Zn	.41	154	.60	.12	45	71%
Cu	.25	94	1.6	.03	11	88%
Ni	.23	86	.36	.05	19	78%
Pb	.12	45	1.4	.02	7.5	83%
Cd	.02	7.5	.10	<.01	<3.8	50%
Cr	.22	83	<.02	<.02	<7.5	91%
Al	5.1	1913	16	<.07	<26	99%
Mn	.30	113	.24	.02	7.5	93%
Fe	10	3750	55	.54	203	95%
Ca	64	24000	68	94	35250	0%
Mg	14	5250	12	20	7500	0%
Ti	<.05	<19	-	<.10	<38	0%
Li	.01	3.8	<.01	<.01	<3.8	0%
Co	<.01	<3.8	.02	<.01	<3.8	0%
Hg(ppb)	9.8		74	.15		99%
Sn	.42	158	.20	.50	188	0%
V	.01	3.8	<.01	<.01	<3.8	0%
As	.003	1.1	.17	<.001	<.38	67%
Ba	.12	45	.98	<.02	<7.5	83%
Sr	.22	83	.49	.25	94	0%
Mo	-	-	-	-	-	-
Ag	-	-	-	-	-	-
Se	-	-	-	-	-	-

(k) MUNICIPALITY: Hamilton
POPULATION SERVED: 325,000
DATE OF SAMPLING: April 27, 1976
FLOW: 57.2 mgd

Parameter	Influent	Influent Loading	Sludge	Effluent	Effluent Loading	% Removal Efficiency
Alkalinity	243	138996	1903	150	85800	38%
Ammonia	32	18304	740	19	10868	41%
Kjeldahl	70	40040	2800	22	12584	69%
Nitrite	.01	5.7	<.01	.03	17	0%
Nitrate	<.10	<57	<.10	.20	114	0%
BOD	280	160160	3300	17	9724	94%
COD	865	494780	48600	61	34892	93%
Susp. Solids	1160	663520	-	50	28600	96%
Diss. Solids	660	377520	-	565	323180	14%
Total Solids	1820	1041040	61100	615	351780	66%
Chloride	152	86944	2195	134	76648	12%
Sulphate	21	12012	8	27	15444	0%
Fluoride	1.0	572	-	-	-	-
Phosphate	220	125840	1600	1.6	915	99%
pH	7.1	-	7.1	7.5	-	-
K	14	8008	120	7.6	4347	46%
Na	150	85800	100	74	42328	51%
Zn	8.1	4633	520	.17	97	98%
Cu	.78	446	71	.02	11	97%
Ni	.44	252	27	.07	40	84%
Pb	1.2	686	96	.02	11	98%
Cd	.02	11	1.5	<.01	<5.7	50%
Cr	2.2	1258	200	.10	57	95%
Al	20	11440	11000	.52	297	97%
Mn	1.0	572	40	.10	57	90%
Fe	64	36608	2200	2.4	1373	96%
Ca	120	68640	2700	68	38896	43%
Mg	29	16588	650	17	9724	41%
Ti	1.2	686	16	<.10	57	92%
Li	.04	23	.75	.01	5.7	75%
Co	.02	11	.75	<.02	<11	0%
Hg(ppb)	2.0		38	.15		93%
Sn	3.5	2002	180	.40	229	89%
V	.04	23	1.4	<.02	<11	50%
As	.03	17	1.2	.002	1.1	93%
Ba	.65	372	57	.03	17	95%
Sr	.68	389	20	.40	229	41%
Mo	-	-	-	-	-	-
Ag	-	-	-	-	-	-
Se	-	-	-	-	-	-

6.6 Preliminary Indication of Arithmetic Average Metal Concentrations

After sampling 20 sewage treatment plants in Ontario of varying types and sizes, the following arithmetic average metal concentrations were compiled. These results give a fairly complete indication of the general chemical spectrum that should be expected in Ontario sewage flows.

TABLE 79. ARITHMETIC AVERAGE METAL CONCENTRATIONS FOR TREATMENT PLANTS IN SAMPLE GROUP

	INFLUENT (mg/l)			SLUDGE (mg/l)			EFFLUENT (mg/l)		
	Av.	Low	High	Av.	Low	High	Av.	Low	High
Zn	1.12	0.03	8.1	181	0.60	650	<0.28	<0.01	2.6
Cu	0.30	<0.01	1.7	19	0.20	71	0.06	<0.01	0.25
Ni	0.11	<0.01	0.44	6.3	<0.20	27	0.05	<0.01	0.23
Pb	0.17	<0.01	1.2	63	0.60	330	0.01	<0.01	0.04
Cd	0.02	<0.01	0.15	0.61	<0.01	2.2	<0.01	<0.01	<0.01
Cr	0.97	0.01	7.9	75	0.02	300	0.09	<0.01	0.33
Al	3.8	0.06	20	1826	16	11000	0.47	<0.02	2.2
Mn	0.15	<0.01	1.0	8.2	0.24	40	0.04	<0.01	0.13
Fe	6.6	0.15	64	4028	10	25000	0.82	<0.04	4.0
Ca	93.7	35	260	5357	68	33000	95	48	240
Mg	22	12	37	660	12	3700	22	1.6	36
Ti	0.15	<0.01	1.2	95	<0.10	510	0.08	<0.01	0.20
Li	0.01	<0.01	0.04	0.41	<0.10	1.9	<0.01	<0.01	<0.01
Co	0.01	<0.01	0.02	0.24	<0.01	0.75	<0.01	<0.01	<0.02
Hg(ppb)	1.03	0.08	9.8	28	4.3	74	0.07	<0.02	0.15
Sn	0.58	<0.20	3.5	32	0.20	180	0.42	0.10	1.6
V	0.01	<0.01	0.04	1.6	<0.01	8.9	0.01	<0.10	<0.02
As	0.005	<0.001	0.03	0.74	0.008	2.4	0.001	<0.001	0.005
Ba	0.17	0.03	0.65	18.2	0.98	57	0.02	<0.01	0.04
Sr	0.52	0.16	2.0	9.4	0.49	32	0.42	0.14	1.1
Mo	0.01	<0.01	0.02	1.2	0.30	2.1	0.01	<0.01	0.03
Ag	<0.01	<0.01	0.02	5	0.50	9.6	<0.01	<0.01	<0.01
Se	0.003	<0.001	0.01	<0.001	<0.001	<0.001	0.002	<0.001	<0.01

6.7 Metal Concentrations and Arithmetic Average Concentrations for the Types of Treatment Plants in the Sample Group

Metal concentrations and arithmetic average concentrations for all lagoon-type treatment plants, primary treatment plants, and activated sludge treatment plants in the sample group are given in Tables 80, 81 and 82.

TABLE 80. METAL CONCENTRATIONS AND ARITHMETIC AVERAGE CONCENTRATIONS FOR LAGOON-TYPE TREATMENT PLANTS

INFLUENT

(Population)	Elmvale (1220)	Markdale (1320)	Stayner (2256)	Shelburne (2919)	Arithmetic Average
Zn	.03	.05	.08	.06	.06
Cu	<.01	<.01	.02	.03	.02
Ni	.02	.04	.03	.05	.04
Pb	<.01	<.01	<.01	<.01	<.01
Cd	<.01	<.01	<.01	<.01	<.01
Cr	.01	<.02	.02	<.02	<.02
Al	.06	.10	.08	.09	.08
Mn	<.01	.03	<.03	<.02	.02
Fe	.20	.15	.15	<.21	.18
Ca	64	67	54	84	67
Mg	13	17	14	20	16
Ti	.02	<.01	.03	.04	.03
Li	<.02	<.01	.02	.01	<.02
Co	<.01	<.01	<.01	<.01	<.01
Hg(ppb)	.08	.18	.08	.15	.13
Sn	<.20	.40	.42	.60	.41
V	.02	<.01	<.01	<.02	<.02
As	.002	<.001	<.001	.003	.002
Ba	.06	.06	.03	.04	.05
Sr	.30	.17	.16	.41	.26
Mo	<.01	<.01	<.01	<.01	<.01
Ag	<.01	<.01	<.01	<.01	<.01
Se	<.001	<.001	<.001	<.001	<.001

TABLE 80. (CONT'D)

EFFLUENT

(Population)	Elmvale (1220)	Markdale (1320	Stayner (2256)	Shelburne (2919)	Arithmetic Average
Zn	.02	.03	.03	.04	.03
Cu	<.01	<.01	.01	<.01	<.01
Ni	<.01	.03	.02	.02	.02
Pb	<.01	<.01	<.01	<.01	<.01
Cd	<.01	<.01	<.01	<.01	<.01
Cr	.01	<.01	.02	<.02	<.02
Al	.04	.08	.02	.05	.05
Mn	<.01	<.01	<.01	<.01	.01
Fe	<.06	<.05	<.04	.08	.06
Ca	60	64	48	82	64
Mg	15	18	15	21	17
Ti	.01	<.01	<.01	.06	<.03
Li	<.01	<.01	<.01	<.01	<.01
Co	<.01	<.01	<.01	<.01	<.01
Hg(ppb)	.05	<.03	<.02	.10	.05
Sn	.10	.15	.18	.15	.25
V	<.01	<.01	<.01	<.02	.01
As	<.001	<.001	<.001	<.001	.001
Ba	.04	.03	.01	.02	.03
Sr	.28	.19	.14	.38	.25
Mo	<.01	<.01	<.01	<.01	<.01
Ag	<.01	<.01	<.01	<.01	<.01
Se	<.001	<.001	<.001	<.001	<.001

TABLE 81. METAL CONCENTRATIONS AND ARITHMETIC AVERAGE CONCENTRATIONS FOR PRIMARY TREATMENT PLANTS

INFLUENT

(Population)	Prescott (5200)	Colling-wood (8500)	Midland (10500)	Owen Sound (17750)	Cornwall (42500)	Arithmetic Average
Zn	-	.06	.75	.15	.50	.37
Cu	-	.05	.02	.10	.40	.14
Ni	-	.02	.21	<.01	.30	.14
Pb	-	.04	.14	.02	.80	.25
Cd	-	<.01	<.01	<.01	.02	.01
Cr	-	.04	1.2	.35	1.0	.65
Al	-	.16	12	2.6	-	4.9
Mn	-	.06	.08	.06	-	.07
Fe	-	.65	6.4	1.1	2.0	2.5
Ca	120	260	64	58	35	107
Mg	35	12	17	2.1	-	17
Ti	-	<.10	<.10	.20	.05	.11
Li	-	<.01	.02	<.01	<.01	.01
Co	-	<.01	<.01	<.01	<.01	.01
Hg(ppb)	-	.09	.52	.08	-	.23
Sn	-	.30	.30	<.20	.40	.30
V	-	.01	<.01	<.01	<.01	.01
As	.004	.002	.02	<.001	<.001	.006
Ba	-	.04	.23	.04	.30	.15
Sr	-	.30	.23	.22	.12	.22
Mo	-	<.01	.02	<.01	<.01	.02
Ag	-	<.01	<.01	<.01	<.01	<.01
Se	<.003	<.001	<.001	<.001	<.001	.001

TABLE 81. (CONT'D)

SLUDGE

(Population)	Prescott (5200)	Colling-wood (8500)	Midland (10500)	Owen Sound (17750)	Cornwall (42500)	Arithmetic Average
Zn	-	-	-	650	-	* 650
Cu	-	-	-	.20	-	* .20
Ni	-	-	-	4.6	-	* 4.6
Pb	-	-	-	330	-	* 330
Cd	-	-	-	215	-	* 215
Cr	-	-	-	.07	-	* .07
Al	-	-	-	160	-	* 160
Mn	-	-	-	4.6	-	* 4.6
Fe	-	-	-	25000	-	*25000
Ca	-	-	-	33000	-	*33000
Mg	-	-	-	3700	-	* 3700
Ti	-	-	-	510	-	* 510
Li	-	-	-	1.9	-	* 1.9
Co	-	-	-	.67	-	* .67
Hg(ppb)	-	-	-	210	-	* 210
Sn	-	-	-	33	-	* 33
V	-	-	-	8.9	-	* 8.9
As	-	-	-	2.4	-	* 2.4
Ba	-	-	-	40	-	* 40
Sr	-	-	-	32	-	* 32
Mo	-	-	-	2.1	-	* 2.1
Ag	-	-	-	9.6	-	* 9.6
Se	-	-	-	<.001	-	* <.001

* Average of one value only.

TABLE 81. (CONT'D)

EFFLUENT

(Population)	Prescott (5200)	Colling-wood (8500)	Midland (10500)	Owen Sound (17750)	Cornwall (42500)	Arithmetic Average
Zn	-	.38	<.01	.26	.15	.20
Cu	-	.04	.03	.05	.20	.08
Ni	-	.02	.22	<.01	.05	.08
Pb	-	.04	<.01	.02	.02	.02
Cd	-	<.01	<.01	<.01	<.01	.01
Cr	-	.03	.33	<.01	.20	.14
Al	-	<.02	.19	.42	1.5	.53
Mn	-	.13	.01	.10	.05	.07
Fe	-	4.0	.20	2.8	.20	1.8
Ca	110	240	60	72	110	118
Mg	30	14	1.6	21	-	17
Ti	-	<.10	<.10	<.10	<.10	.10
Li	-	<.01	<.01	<.01	<.01	.01
Co	-	<.01	<.01	<.01	<.01	.01
Hg(ppb)	-	.06	.08	<.05	-	.06
Sn	-	1.6	.10	<.20	1.0	.73
V	-	.01	<.01	<.01	<.01	.01
As	.001	<.001	<.001	.001	<.001	.001
Ba	-	.03	.03	.05	.02	.03
Sr	-	.31	.17	.21	.08	.19
Mo	-	.02	<.01	.02	<.01	.02
Ag	-	<.01	<.01	<.01	<.01	<.01
Se	<.001	<.001	<.001	<.001	<.001	<.001

TABLE 82. METAL CONCENTRATIONS AND ARITHMETIC AVERAGE CONCENTRATIONS FOR ACTIVATED SLUDGE PLANTS

INFLUENT

(Population)	Burlington (4500)	Elmira (4820)	Fergus (5600)	Orangeville (10000)	Stratford (25000)	Barrie (31390)
Zn	.04	-	4.5	-	-	.43
Cu	.08	-	1.7	-	-	.24
Ni	.01	-	.06	-	-	.08
Pb	<.01	-	.09	-	-	.08
Cd	<.01	-	<.01	-	-	<.01
Cr	<.02	-	-	-	-	7.9
Al	.19	-	1.9	-	-	1.3
Mn	.04	-	.15	-	-	.21
Fe	.20	-	4.3	-	-	1.6
Ca	91	110	130	96	140	41
Mg	21	32	37	26	34	15
Ti	<.05	-	-	-	-	.06
Li	.02	-	.01	-	-	<.01
Co	<.01	-	<.01	-	-	<.01
Hg(ppb)	.36	-	.26	.13	.10	.28
Sn	.89	-	< .20	-	-	.50
V	.02	-	.02	-	-	<.02
As	.003	.005	.003	.003	.006	<.001
Ba	.05	-	.26	-	-	.54
Sr	.45	-	2.0	-	-	.26
Mo	-	-	<.01	-	-	.02
Ag	-	-	<.01	-	-	<.01
Se	-	.014	<.001	.002	.004	<.001

TABLE 82. (CONT'D)

INFLUENT (Cont'd)

(Population)	Guelph (63000)	Brantford (65124)	Port Weller (71520)	Lakeview (200000)	Hamilton (325000)	Arithmetic Average
Zn	.88	-	.78	.41	8.1	2.2
Cu	.61	-	.21	.25	.78	.55
Ni	.14	-	.07	.23	.44	.15
Pb	.08	-	.06	.12	1.2	.23
Cd	.01	-	.15	.02	.02	.03
Cr	-	-	.64	.22	2.2	2.2
Al	-	-	5.9	5.1	20	5.7
Mn	.05	-	.15	.30	1.0	.27
Fe	2.2	-	5.6	10	64	13
Ca	93	82	100	64	120	97
Mg	31	21	15	14	29	25
Ti	-	-	<.10	<.05	1.2	.29
Li	.01	-	.01	.01	.04	.01
Co	<.01	-	<.01	<.01	.02	<.01
Hg(ppb)	.16	.11	.50	9.8	2.0	1.4
Sn	<.20	-	<.20	.42	3.5	.84
V	.02	-	<.01	.01	.04	<.02
As	.003	.003	<.001	.003	.03	.006
Ba	.15	-	.12	.12	.65	.27
Sr	1.8	-	.31	.22	.68	.82
Mo	.02	-	<.01	-	-	.02
Ag	<.01	-	.02	-	-	.01
Se	<.001	.014	.002	-	-	.005

TABLE 82. (CONT'D)

SLUDGE

(Population)	Burlington (4500)	Elmira (4820)	Fergus (5600)	Orange-ville (10000)	Stratford (25000)	Barrie (31390)
Zn	1.2	-	80	-	-	1.2
Cu	2.2	-	87	-	-	17
Ni	<.20	-	.84	-	-	11
Pb	.60	-	1.1	-	-	9.1
Cd	<.01	-	.05	-	-	.02
Cr	<.04	-	18	-	-	300
Al	27	-	20	-	-	850
Mn	.70	-	1.5	-	-	9.9
Fe	10	-	620	-	-	250
Ca	190	-	260	-	-	1100
Mg	45	-	65	-	-	120
Ti	<.10	-	<.10	-	-	42
Li	<.10	-	<.01	-	-	<.10
Co	<.20	-	.02	-	-	<.01
Hg(ppb)	4.3	-	14	-	-	29
Sn	<1.5	-	.60	-	-	4.0
V	.35	-	.03	-	-	<.20
As	.008	-	.64	-	-	.08
Ba	1.0	-	4.5	-	-	23
Sr	1.2	-	3.2	-	-	5.1
Mo	-	-	-	-	-	.30
Ag	-	-	-	-	-	.50
Se	-	-	-	-	-	<.001

TABLE 82. (CONT'D)

SLUDGE (Cont'd)

(Population)	Guelph (63000)	Brantford (65124)	Port Weller (71520)	Lakeview (200000)	Hamilton (325000)	Arithmetic Average
Zn	14	-	-	.60	520	103
Cu	7.3	-	-	1.6	71	31
Ni	.22	-	-	.36	27	6.6
Pb	3.7	-	-	1.4	96	19
Cd	.45	-	-	.10	1.5	.36
Cr	5.2	-	-	<.02	200	87
Al	710	-	-	16	11000	2104
Mn	.52	-	-	.24	40	8.8
Fe	67	-	-	55	2200	534
Ca	180	-	-	68	2700	750
Mg	25	-	-	12	650	153
Ti	.30	-	-	-	16	11.7
Li	<.01	-	-	<.01	.75	.16
Co	.02	-	-	.02	.75	.17
Hg(ppb)	6.7	-	-	74	38	27.7
Sn	.80	-	-	.20	180	31
V	.04	-	-	<.01	1.4	.34
As	.70	-	-	.17	1.2	.47
Ba	2.2	-	-	.98	57	15
Sr	3.5	-	-	.49	20	5.6
Mo	-	-	-	-	-	* .30
Ag	-	-	-	-	-	* .50
Se	-	-	-	-	-	* .001

* Average of one value only.

TABLE 82. (CONT'D)

EFFLUENT

(Population)	Burlington (4500)	Elmira (4820)	Fergus (5600)	Orange-ville (10000)	Stratford (25000)	Barrie (31390)
Zn	.03	-	2.6	-	-	.13
Cu	.02	-	4.3	-	-	.16
Ni	<.01	-	<.01	-	-	.23
Pb	<.01	-	<.01	-	-	.02
Cd	<.01	-	<.01	-	-	<.01
Cr	<.04	-	.12	-	-	.17
Al	<.03	-	<.06	-	-	1.4
Mn	.03	-	.04	-	-	.05
Fe	<.05	-	3.1	-	-	.11
Ca	.88	120	110	89	120	71
Mg	22	33	31	24	36	15
Ti	<.10	-	<.10	-	-	<.20
Li	.01	-	<.01	-	-	<.01
Co	<.01	-	<.01	-	-	<.01
Hg(ppb)	<.03	-	.05	.03	<.03	.05
Sn	.30	-	.20	-	-	1.1
V	<.01	-	<.01	-	-	<.02
As	<.001	.002	<.001	.001	<.001	<.001
Ba	.08	-	.03	-	-	.02
Sr	.96	-	1.0	-	-	.23
Mo	-	-	-	-	-	.03
Ag	-	-	-	-	-	<.10
Se	-	-	-	<.001	<.001	<.001

TABLE 82. (CONT'D)

EFFLUENT (Cont'd)

(Population)	Guelph (63000)	Brantford (65124	Port Weller (71520)	Lakeview (200000)	Hamilton (325000)	Arithmetic Average
Zn	.27	-	.06	.12	.17	.48
Cu	.10	-	<.01	.03	.02	.66
Ni	.04	-	.03	.05	.07	.06
Pb	.03	-	<.01	.02	.02	.02
Cd	<.01	-	<.01	<.01	<.01	<.01
Cr	.24	-	.04	<.02	.10	.10
Al	2.2	-	.50	<.07	.52	.68
Mn	.05	-	.08	.02	.10	.05
Fe	.72	-	.20	.54	2.4	1.0
Ca	110	83	95	94	68	87.4
Mg	35	22	31	20	17	26
Ti	<.10	-	.10	<.10	<.10	.11
Li	<.01	-	<.01	<.01	.01	<.01
Co	<.01	-	<.01	<.01	<.02	<.01
Hg(ppb)	.11	.05	<.05	.15	.15	.70
Sn	.20	-	<.20	.50	.40	.41
V	<.01	-	<.01	<.01	<.02	<.01
As	<.001	<.001	.005	<.001	.002	<.002
Ba	.02	-	<.01	<.02	.03	.03
Sr	1.1	-	.53	.25	.40	.64
Mo	-	-	<.01	-	-	.02
Ag	-	-	<.01	-	-	.06
Se	-	<.001	.003	-	-	.001

6.8 Removal Efficiencies for Treatment Plants in the Sample Group

Tables 83 to 86 give arithmetic average metal removal efficiencies for the treatment plants in the sample group studied in the 1975-76 field season.

TABLE 83. ARITHMETIC AVERAGE METAL REMOVAL EFFICIENCIES FOR ALL TREATMENT PLANTS IN SAMPLE GROUP

Parameter	Average Metal Removal Efficiency
Zn	54%
Cu	49%
Ni	41%
Pb	46%
Cd	16%
Cr	54%
Al	69%
Mn	48%
Fe	68%
Ca	6.5%
Mg	4.6%
Ti	24%
Li	12%
Co	0%
Hg	61%
Sn	40%
V	20%
As	73%
Ba	62%
Sr	15%
Mo	5.0%
Ag	14%
Se	23%
Arithmetic Average	24%

TABLE 84. METAL REMOVAL EFFICIENCIES OF LAGOON-TYPE TREATMENT PLANTS IN SAMPLE GROUP

(Population)	Elmvale (1220)	Markdale (1320)	Stayner (2256)	Shelburne (2919)	Arithmetic Average
Zn	33%	40%	63%	33%	42%
Cu	0%	0%	50%	0%	13%
Ni	50%	25%	33%	50%	40%
Pb	0%	0%	0%	0%	0%
Cd	0%	0%	0%	0%	0%
Cr	0%	50%	0%	0%	13%
Al	33%	20%	75%	33%	40%
Mn	0%	67%	67%	0%	34%
Fe	70%	67%	73%	70%	70%
Ca	6.3%	4.5%	11%	6.3%	7%
Mg	0%	0%	0%	0%	0%
Ti	50%	0%	67%	50%	42%
Li	50%	0%	50%	50%	38%
Co	0%	0%	0%	0%	0%
Hg	38%	83%	75%	38%	59%
Sn	50%	63%	57%	50%	55%
V	50%	0%	0%	50%	25%
As	50%	0%	0%	50%	25%
Ba	33%	50%	67%	33%	46%
Sr	6.3%	0%	13%	6.3%	6.4%
Mo	0%	0%	0%	0%	0%
Ag	0%	0%	0%	0%	0%
Se	0%	0%	0%	0%	0%
Arithmetic Average	23%	20%	31%	23%	24%

TABLE 85. METAL REMOVAL EFFICIENCIES OF PRIMARY TREATMENT PLANTS IN SAMPLE GROUP

(Population)	Prescott (5200)	Colling-wood (8500)	Midland (10500)	Owen sound (17750)	Cornwall (42500)	Arithmetic Average
Zn	-	0%	99%	0%	70%	42%
Cu	-	20%	0%	50%	50%	30%
Ni	-	0%	0%	0%	83%	21%
Pb	-	0%	93%	0%	98%	48%
Cd	-	0%	0%	0%	50%	13%
Cr	-	25%	72%	97%	80%	69%
Al	-	88%	98%	84%	-	90%
Mn	-	0%	88%	0%	-	29%
Fe	-	0%	97%	0%	90%	47%
Ca	8.0%	8.0%	6.2%	0%	0%	4.4%
Mg	14%	0%	9.1%	0%	-	5.8%
Ti	-	0%	0%	50%	0%	13%
Li	-	0%	50%	0%	0%	13%
Co	-	0%	0%	0%	0%	0%
Hg	-	33%	0%	38%	-	24%
Sn	-	0%	67%	0%	0%	17%
V	-	0%	0%	0%	0%	0%
As	75%	50%	94%	0%	0%	44%
Ba	-	25%	87%	0%	93%	51%
Sr	-	0%	29%	4.5%	30%	16%
Mo	-	0%	50%	0%	0%	13%
Ag	-	0%	85%	0%	0%	21%
Se	67%	0%	0%	0%	0%	13%
Arithmetic Average	41%	10.8%	45%	14%	34%	27%

TABLE 86. METAL REMOVAL EFFICIENCIES OF ACTIVATED SLUDGE PLANTS IN SAMPLE GROUP

(Population)	Burlington (4500)	Elmira (4820)	Fergus (5600)	Orange-ville (10000)	Stratford (25000)	Barrie (31390)
Zn	25%	-	42%	-	-	70%
Cu	75%	-	85%	-	-	33%
Ni	0%	-	83%	-	-	0%
Pb	0%	-	89%	-	-	75%
Cd	0%	-	0%	-	-	0%
Cr	0%	-	-	-	-	98%
Al	84%	-	97%	-	-	0%
Mn	25%	-	73%	-	-	76%
Fe	75%	-	28%	-	-	93%
Ca	3.0%	0%	15%	7.0%	14%	0%
Mg	0%	0%	16%	8.0%	0%	0%
Ti	0%	-	-	-	-	0%
Li	50%	-	0%	-	-	0%
Co	0%	-	0%	-	-	0%
Hg	92%	-	81%	77%	70%	82%
Sn	97%	-	0%	-	-	0%
V	50%	-	50%	-	-	0%
As	100%	60%	100%	67%	83%	0%
Ba	0%	-	89%	-	-	96%
Sr	0%	-	50%	-	-	12%
Mo	-	-	-	-	-	0%
Ag	-	-	-	-	-	0%
Se	-	58%	-	50%	75%	0%
Arithmetic Average	34%	30%	50%	42%	48%	28%

TABLE 86. (CONT'D)

(Population)	Guelph (63000)	Brantford (65124)	Port Weller (71520)	Lakeview (200,000)	Hamilton (325000)	Arithmetic Average
Zn	69%	-	92%	71%	98%	67%
Cu	84%	-	95%	88%	97%	80%
Ni	71%	-	57%	78%	84%	53%
Pb	63%	-	83%	83%	98%	70%
Cd	0%	-	93%	50%	50%	28%
Cr	-	-	94%	91%	96%	76%
Al	-	-	92%	99%	97%	78%
Mn	-	-	47%	93%	90%	67%
Fe	67%	-	96%	95%	96%	79%
Ca	0%	0%	5.0%	0%	43%	8.0%
Mg	0%	0%	0%	0%	41%	5.9%
Ti	-	-	0%	0%	92%	18%
Li	0%	-	0%	0%	75%	18%
Co	0%	-	0%	0%	0%	0%
Hg	0%	55%	90%	99%	93%	74%
Sn	31%	-	0%	88%	89%	44%
V	50%	-	0%	0%	50%	29%
As	100%	67%	0%	100%	92%	70%
Ba	87%	-	92%	83%	95%	77%
Sr	39%	-	0%	0%	41%	20%
Mo	-	-	0%	-	-	0%
Ag	-	-	50%	-	-	25%
Se	-	93%	0%	-	-	46%
Arithmetic Average	41%	43%	43%	56%	76%	45%

6.9 Removal Efficiencies for Ontario Plants Based on 1974-75 Data

The following tables gives arithmetic average metal removal efficiencies for Ontario plants based on the analytical data for 1974-75 provided in Section 2.

TABLE 87. METAL REMOVAL EFFICIENCIES FOR ALL ONTARIO PLANTS BASED ON 1974-75 DATA

Zn	60%	Li	-
Cu	46%	Co	-
Ni	19%	Hg (ppb)	-
Pb	41%	Sn	-
Cd	0%	V	-
Cr	52%	As	-
Al	67%	Ba	-
Mn	61%	Sr	-
Fe	81%	Mo	-
Ca	-	Ag	-
Mg	-	Se	-
Ti	-		

TABLE 88. METAL REMOVAL EFFICIENCIES FOR PRIMARY SEDIMENTATION PLANTS BASED ON 1974-75 DATA

(Pop'n)	Prescott (4982)	Smiths Falls (9232)	Lincoln (14252)	Grimsby (15555)	Welland (44972)		Niagara Falls (67892)	Arithmetic Average
					N.	S.		
Zn	-	-	33%	63%	56%	64%	43%	52%
Cu	-	-	40%	17%	64%	64%	43%	46%
Ni	-	-	0%	0%	20%	20%	0%	8%
Pb	-	-	0%	0%	66%	66%	0%	26%
Cd	-	-	0%	0%	0%	0%	0%	0%
Cr	-	-	0%	0%	57%	57%	0%	23%
Al	-	0%	-	-	-	-	-	0%*
Mn	-	0%	0%	0%	53%	53%	0%	18%
Fe	37%	-	-	-	66%	77%	-	60%
Ca	-	-	-	-	-	-	-	-
Mg	-	-	-	-	-	-	-	-
Ti	-	-	-	-	-	-	-	-
Li	-	-	-	-	-	-	-	-
Co	-	-	-	-	-	-	-	-
Hg(ppb)	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-
V	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-
Ba	-	-	-	-	-	-	-	-
Sr	-	-	-	-	-	-	-	-
Mo	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-
Se	-	-	-	-	-	-	-	-
Arithmetic Average	37%*	0%	10%	11%	48%	50%	12%	26% Total Average

* One value reported

TABLE 89. METAL REMOVAL EFFICIENCIES FOR ACTIVATED SLUDGE PLANTS BASED ON 1974-75 DATA

	Brad-ford	Inger-soll	Aurora	Ajax	Orillia	New-market	Markham	Peter-borough	Guelph			Arithmetic Average
(Pop'n)	(4566)	(8105)	(13540)	(19659)	(23911)	(24142)	(53093)	(59337)	(68192)			
Zn	-	-	85%	-	-	-	63%	-	71%	64%	57%	68%
Cu	0%	-	83%	77%	-	-	84%	96%	85%	89%	89%	75%
Ni	-	-	20%	66%	-	-	43%	-	-	-	-	43%
Pb	-	-	63%	89%	-	-	-	-	-	-	-	76%
Cd	-	-	0%	-	-	-	-	-	-	-	-	0%*
Cr	-	-	46%	67%	-	-	-	83%	84%	89%	92%	77%
Al	-	-	-	-	83%	-	-	-	90%	69%	62%	76%
Mn	-	-	88%	-	-	79%	-	-	-	-	-	84%
Fe	-	97%	-	-	-	-	-	-	89%	92%	92%	93%
Ca	-	-	-	-	-	-	-	-	-	-	-	-
Mg	-	-	-	-	-	-	-	-	-	-	-	-
Ti	-	-	-	-	-	-	-	-	-	-	-	-
Li	-	-	-	-	-	-	-	-	-	-	-	-
Co	-	-	-	-	-	-	-	-	-	-	-	-
Hg(ppb)	-	-	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-	-	-
V	-	-	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-	-	-
Ba	-	-	-	-	-	-	-	-	-	-	-	-
Sr	-	-	-	-	-	-	-	-	-	-	-	-
Mo	-	-	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-	-	-
Se	-	-	-	-	-	-	-	-	-	-	-	-
Arithmetic Average	0%*	97%*	55%	75%	83%	79%	63%	90%	84%	81%	78%	66%

* One value only reported.

6.10 Metal Loadings for Treatment Plants in the Sample Group

Tables 90 to 93 give arithmetic average metal loadings (lb/day) for the treatments plants in the sample group studied in the 1975-76 field season.

TABLE 90. METAL LOADINGS FOR ALL TREATMENT PLANTS IN THE SAMPLE GROUP (lb/day)

Parameter	Influent	Effluent
Zn	337	16
Cu	45	4.1
Ni	26	5.7
Pb	46	1.8
Cd	2.3	0.90
Cr	146	8.2
Al	1090	52
Mn	51	5.9
Fe	2762	126
Ca	6770	6220
Mg	1650	1563
Ti	56	1968
Li	1.3	0.90
Co	1.3	1.2
Hg	0.07	0.01
Sn	152	42
V	2.2	1.3
As	9.0	0.12
Ba	33	2.3
Sr	50	35
Mo	0.47	0.44
Ag	1.0	0.84
Se	0.04	0.04
Arithmetic Average	575	437

TABLE 91. METAL LOADINGS FOR LAGOON-TYPE TREATMENT PLANTS IN THE SAMPLE GROUP (lb/day)

INFLUENT

	Elmvale (Pop'n.) (1220)	Markdale (1320)	Stayner (2256)	Shelburne (2919)	Arithmetic Average
Zn	.05	.13	<.08	.25	.13
Cu	<.02	<.03	.02	.13	.05
Ni	.04	.10	<.03	.21	<.10
Pb	<.02	<.03	<.01	.04	<.03
Cd	<.02	<.03	<.01	<.04	<.03
Cr	.02	<.05	<.02	<.08	.04
Al	.12	.26	<.08	<.38	.21
Mn	<.02	.08	<.03	<.08	.05
Fe	.36	.39	<.15	<.88	.45
Ca	115	174	53	353	174
Mg	23	44	<14	84	41
Ti	.04	<.03	<.03	.17	.07
Li	<.04	<.03	<.02	.04	<.03
Co	<.02	<.03	<.01	<.04	<.03
Hg	.000	.000	.000	.000	.000
Sn	.36	1.0	.41	2.5	1.1
V	.04	<.03	<.01	<.08	.04
As	.003	<.003	<.001	.01	.004
Ba	.10	.16	<.03	.17	.12
Sr	.54	.44	.16	1.7	.71
Mo	<.02	<.03	<.01	<.04	<.03
Ag	<.02	<.03	<.01	<.04	<.03
Se	<.002	<.003	<.001	<.004	<.003
Arithmetic Average:	6.1	9.6	3.0	19	9.5

TABLE 91. (CONT'D)

EFFLUENT

(Pop'n.)	Elmvale (1220)	Markdale (1320)	Stayner (2256)	Shelburne (2919)	Arithmetic Average
Zn	.04	.08	<.03	.17	.08
Cu	<.02	<.03	<.01	<.04	<.03
Ni	<.02	.08	<.02	.08	.05
Pb	<.02	<.03	<.01	<.04	<.03
Cd	<.02	<.03	<.01	<.04	<.03
Cr	.02	<.03	<.02	<.08	.04
Al	.07	.21	<.02	.21	.13
Mn	<.02	<.03	<.01	<.04	<.03
Fe	.11	<.13	<.04	.34	.16
Ca	108	166	47	344	166
Mg	27	47	<15	88	44
Ti	.02	<.03	<.01	.25	.08
Li	<.02	<.03	<.01	<.04	<.03
Co	<.02	<.03	<.01	<.04	<.03
Hg	.000	.000	.000	.000	.000
Sn	.18	.39	<.18	.63	.35
V	<.02	<.03	<.01	<.08	.04
As	.001	<.003	<.001	<.004	.002
Ba	.07	.08	<.01	.08	.06
Sr	.50	.49	.14	1.6	.68
Mo	<.02	<.03	<.01	<.04	.03
Ag	<.02	<.03	<.01	<.04	<.03
Se	<.002	<.003	<.001	<.004	<.003
Arithmetic Average	5.9	9.3	2.7	19	9.2

TABLE 92. METAL LOADINGS FOR PRIMARY TREATMENT PLANTS IN THE SAMPLE GROUP (lb/day)

INFLUENT

(Pop'n.)	Prescott (5200)	Collingwood (8500)	Midland (10500)	Owen Sound (17750)	Cornwall (42500	Arithmetic Average
Zn	-	1.2	11	5.0	38	14
Cu	-	1.0	.30	3.3	30	8.7
Ni	-	.40	3.2	<.33	23	6.7
Pb	-	.80	2.1	.66	61	16
Cd	-	<.20	<.15	<.33	1.5	.55
Cr	-	.80	18	12	76	27
Al	-	3.2	180	86	-	90
Mn	-	1.2	1.2	2.0	-	1.5
Fe	-	13	96	36	152	75
Ca	988	5252	962	1914	2664	2356
Mg	288	242	256	693	-	370
Ti	-	<2.0	<1.5	6.6	3.8	3.5
Li	-	<.20	.30	.33	.76	.40
Co	-	<.20	<.15	.33	.76	.36
Hg	-					
Sn	-	6.1	4.5	6.6	30	12
V	-	.20	<.15	.33	.76	.36
As	103	.04	.24	<.03	.08	21
Ba	-	.81	3.5	1.3	23	7.2
Sr	-	6.1	3.5	7.3	9.1	6.5
Mo	-	<.20	.30	<.33	<.76	.40
Ag	-	<.20	7.8	<.33	<.76	2.3
Se	.02	<.02	.02	<.03	<.08	.03
Arithmetic Average	345	251	71	126	164	137

TABLE 92. (CONT'D)

EFFLUENT

(Pop'n.)	Prescott (5200)	Collingwood (8500)	Midland (10500)	Owen Sound (17750)	Cornwall (42500)	Arithmetic Average
Zn	-	7.7	<.15	8.6	11	6.9
Cu	-	.80	.45	1.7	15	4.5
Ni	-	.40	3.3	<.33	3.8	2.0
Pb	-	.80	.15	.66	1.5	.78
Cd	-	<.20	.15	<.33	.76	.36
Cr	-	.61	5.0	<.33	15	5.2
Al	-	<.40	2.9	14	114	33
Mn	-	2.6	.15	3.3	3.8	2.5
Fe	-	81	3.0	92	15	48
Ca	905	4848	902	2376	8371	3480
Mg	247	283	24	693	-	312
Ti	-	<2.0	<1.5	<.33	.76	1.2
Li	-	<.20	<.15	<.33	.76	1.2
Co	-	<.20	<.15	<.33	.76	1.2
Hg	-					
Sn	-	32	1.5	6.6	76	29
V	-	.20	<.15	.33	.76	.36
As	.008	<.02	<.02	.03	.08	.03
Ba	-	.61	.45	1.7	1.5	1.1
Sr	-	6.3	2.6	6.9	6.1	5.5
Mo	-	.40	<.15	.66	<.76	.49
Ag	-	<.20	1.2	<.33	<.76	.62
Se	.008	<.02	<.02	<.03	.08	.03
Arithmetic Average	288	339	43	146	411	179

TABLE 93. METAL LOADINGS FOR ACTIVATED SLUDGE PLANTS IN THE SAMPLE GROUP (lb/day)

INFLUENT

	Burlington	Elmira	Fergus	Orangeville	Stratford	Barrie
(Pop'n.)	(4500)	(4820)	(5600)	(10000)	(25000)	(31390)
Zn	.40	-	41	-	-	22
Cu	.80	-	15	-	-	12
Ni	.10	-	.54	-	-	4.0
Pb	<.10	-	.81	-	-	4.0
Cd	<.10	-	<.09	-	-	<.50
Cr	<.20	-	-	-	-	396
Al	1.9	-	17	-	-	65
Mn	.40	-	1.4	-	-	11
Fe	2.0	-	39	-	-	80
Ca	901	110	1174	576	140	2054
Mg	208	32	334	156	34	752
Ti	<.50	-	-	-	-	3.0
Li	.20	-	.09	-	-	<.50
Co	<.10	-	<.09	-	-	<.50
Hg						
Sn	8.8	-	<1.8	-	-	25
V	.20	-	.18	-	-	<1.0
As	.03	.005	27	.02	.006	<.05
Ba	.50	-	2.4	-	-	27
Sr	4.5	-	18	-	-	13
Mo	-	-	<.09	-	-	1.0
Ag	-	-	<.09	-	-	<.50
Se	-	.01	<.01	.01	.17	<.05
Arithmetic Average	59	36	84	183	44	158

TABLE 93. (CONT'D)

INFLUENT (Cont'd)

	Guelph (Pop'n.) (63000)	Brantford (65124)	Port Weller (71520)	Lakeview (200,000)	Hamilton (325000)	Arithmetic Average
Zn	87	-	62	154	4633	714
Cu	60	-	17	94	446	92
Ni	14	-	5.6	86	252	52
Pb	7.9	-	4.8	45	686	107
Cd	.98	-	12	7.5	11	4.6
Cr	-	-	51	82	1258	357
Al	-	-	469	1910	11440	2317
Mn	4.9	-	12	112	572	102
Fe	216	-	445	3745	36608	5876
Ca	9138	8282	7950	23968	68640	11176
Mg	3046	2121	1193	5243	16588	2701
Ti	-	-	<8.0	<19	686	143
Li	.98	-	.80	3.8	23	4.2
Co	<.98	-	<.80	<3.8	11	2.5
Hg						
Sn	<20	-	<16	157	2002	319
V	2.0	-	<.80	3.8	23	4.4
As	30	.30	<.08	1.1	17	6.9
Ba	15	-	9.5	45	372	67
Sr	196	-	25	82	389	104
Mo	2.0	-	<.80	-	-	.97
Ag	<.98	-	1.6	-	-	.79
Se	<.10	-	.16	-	-	.07
Arithmetic Average	676	3468	467	1882	7614	1098

TABLE 93. (CONT'D)

EFFLUENT

(Pop'n.)	Burlington (4500)	Fergus (5600)	Orangeville (10000)	Elmira (4820)	Stratford (25000)	Barrie (31390)
Zn	.30	24	-	-	-	6.5
Cu	.20	2.3	-	-	-	8.0
Ni	<.10	<.09	-	-	-	12
Pb	<.10	<.09	-	-	-	1.0
Cd	<.10	<.09	-	-	-	<.50
Cr	<.40	1.1	-	-	-	8.5
Al	<.30	<.54	-	-	-	70
Mn	.30	.36	-	-	-	2.5
Fe	<.50	28	-	-	-	5.5
Ca	871	993	534	120	5040	3557
Mg	218	280	144	33	1512	752
Ti	<.99	<.09	-	-	-	<10.0
Li	.10	<.09	-	-	-	<.50
Co	<.10	<.09	-	-	-	<.50
Hg						
Sn	3.0	1.8	-	-	-	55
V	<.10	<.09	-	-	-	<1.0
As	<.01	<.01	.006	.002	<.004	<.05
Ba	.80	.27	-	-	-	1.0
Sr	9.5	9.1	-	-	-	13
Mo	-	-	-	-	-	1.5
Ag	-	-	-	-	-	5.0
Se	-	-	.006	.006	<.004	<.05
Arithmetic Average	58	71	170	38	1638	205

TABLE 93. (CONT'D)

EFFLUENT (Cont'd)

(Pop'n.)	Guelph (63000)	Brantford (65124)	Port Weller (71520)	Lakeview (200000)	Hamilton (325000)	Arithmetic Average
Zn	27	-	4.8	45	97	29
Cu	9.8	-	<.80	11	11	6.2
Ni	3.9	-	2.4	19	40	11
Pb	2.9	-	<.80	7.5	11	3.3
Cd	<.98	-	<.80	<3.8	<5.7	1.7
Cr	24	-	3.2	<7.5	57	15
Al	216	-	40	<26	297	93
Mn	4.9	-	6.4	7.5	57	11
Fe	71	-	16	202	1373	242
Ca	10808	8383	7553	35203	38896	10178
Mg	3439	2222	2465	7490	9724	2571
Ti	<9.8	-	8.0	<38	<5.7	10.4
Li	<.98	-	<.80	<3.8	5.7	1.7
Co	<.98	-	<.80	<3.8	<11	2.5
Hg						
Sn	20	-	<16	187	229	73
V	<.98	-	<.80	<3.8	<11	2.5
As	<.10	<.10	.40	<.38	1.1	.20
Ba	2.0	-	<.80	<7.5	17	4.2
Sr	108	-	42	94	229	72
Mo	-	-	<.80	-	-	1.2
Ag	-	-	<.80	-	-	2.9
Se	-	<.10	.24	-	-	.07
Arithmetic Average	776	2651	462	2282	2688	606

6.11 Plants in Sample Group with Effluent Parameter Concentrations Greater than Influent Parameter Concentrations

	LAGOONS				PRIMARY TREATMENT PLANTS		
Parameter	Elmvale	Mark-dale	Stayner	Shel-burne	Prescott	Colling-wood	Midland
Alkalinity					X		X
Ammonia							X
Kjeldahl						X	
Nitrite						X	
Nitrate					X		
BOD							
COD							
Susp. Solids							
Diss. Solids							
Total Solids							
Chloride					X		
Sulphate		X					
Fluoride							
Phosphate							
pH							
K					X		X
Na					X		
Zn						X	
Cu							X
Ni							X
Pb							
Cd							
Cr							
Al							
Mn						X	
Fe						X	
Ca					X		
Mg	X	X	X	X	X	X	
Ti							
Li							
Co							
Hg(ppb)							
Sn						X	
V							
As							
Ba							
Sr		X				X	
Mo						X	
Ag							
Se							

Parameter	PRIMARY TREATMENT PLANTS		ACTIVATED SLUDGE PLANTS				
	Owen Sound	Cornwall	Burl-ington	Elmira	Fergus	Orange-ville	Stratford
Alkalinity		X	X		X		
Ammonia							
Kjeldahl	X						
Nitrite							
Nitrate	X	X	X	X	X	X	X
BOD							
COD							
Susp. Solids							
Diss. Solids	X					X	X
Total Solids							
Chloride	X	X		X			X
Sulphate			X			X	X
Fluoride							
Phosphate			X				
pH							
K					X		
Na					X		X
Zn	X	X					
Cu							
Ni							
Pb							
Cd							
Cr							
Al							
Mn	X						
Fe	X						
Ca	X	X		X			
Mg			X	X			X
Ti			X				
Li							
Co							
Hg(ppb)							
Sn		X					
V							
As							
Ba	X		X				
Sr			X				
Mo	X	X					
Ag							
Se							

ACTIVATED SLUDGE PLANTS (Cont'd)

Parameter	Barrie	Guelph	Brantford	Port Weller	Lakeview	Hamilton
Alkalinity		X			X	
Ammonia						
Kjeldahl						
Nitrite						
Nitrate	X	X	X	X	X	X
BOD						
COD						
Susp. Solids			X			
Diss. Solids		X	X	X	X	
Total Solids		X	X			
Chloride		X	X		X	
Sulphate					X	X
Fluoride						
Phosphate						
pH						
K						
Na		X	X			
Zn						
Cu						
Ni	X					
Pb						
Cd						
Cr						
Al	X					
Mn						
Fe						
Ca	X	X	X		X	
Mg		X	X	X	X	
Ti	X				X	
Li						
Co						
Hg(ppb)						
Sn	X				X	
V						
As				X		
Ba						
Sr				X	X	
Mo	X					
Ag						
Se				X		

6.12 Ratios of Some Common Metals in Treatment Plant Influents and Effluents

See Tables 94 to 97.

TABLE 94. METAL RATIOS IN TREATMENT PLANT INFLUENTS

MUNICIPALITY	Zn:Cu	Pb:Cu	Ni:Cu	Cu:Zn	Pb:Zn	Ni:Zn	Cu:Pb	Zn:Pb	Ni:Pb	Cu:Ni	Pb:Ni	Zn:Ni
1. LAGOONS												
Elmvale	3.0	1.0	2.0	.33	.33	.67	1.0	3.0	2.0	.50	.50	1.5
Markdale	4.0	1.0	2.0	.25	.25	1.3	1.0	4.0	2.0	.20	.20	.80
Stayner	4.0	.50	1.5	.25	.13	.38	2.0	8.0	3.0	.67	.33	2.7
Shelburne	2.0	.33	1.7	.50	.17	.83	3.0	6.0	5.0	.60	.20	1.2
2. PRIMARY TREATMENT												
Prescott	-	-	-	-	-	-	-	-	-	-	-	-
Collingwood	1.2	.80	.40	.83	.67	.33	1.3	1.5	.50	2.5	2.0	3.0
Midland	38	7.0	11	.03	.19	.28	.14	5.4	1.5	.09	.67	3.6
Owen Sound	1.5	.20	.10	.67	.13	.50	5.0	7.5	.50	10.0	2.0	15
Cornwall	1.3	2.0	1.0	.80	1.6	.80	.50	.63	.50	1.0	2.0	1.2
3. ACTIVATED SLUDGE												
Burlington	.50	.13	.13	2.0	.25	.25	8.0	4.0	1.0	8.0	1.0	4.0
Elmira	-	-	-	-	-	-	-	-	-	-	-	-
Fergus	2.7	.05	1.0	.38	.02	.01	19	50	.67	28	1.5	75
Orangeville	-	-	-	-	-	-	-	-	-	-	-	-
Stratford	-	-	-	-	-	-	-	-	-	-	-	-
Barrie	1.8	.33	.33	.56	.19	.19	3.0	5.4	1.0	3.0	1.0	5.4
Guelph	1.4	.13	.23	.69	.09	.16	7.6	11	1.8	4.4	.57	6.3
Brantford	-	-	-	-	-	-	-	-	-	-	-	-
Port Weller	.05	81	3.8	21	1700	80	.01	.06	.05	.26	21	.01
Lakeview	1.6	.48	.92	.61	.29	.56	2.1	3.4	1.9	1.1	.52	1.8
Hamilton	10.4	1.5	.56	.10	.15	.05	.65	6.8	.37	1.8	2.7	18
AVERAGE:	2.7	1.2	1.2	.61	.34	.49	2.7	5.1	1.3	2.6	1.1	5.0

TABLE 95. RANGE OF INFLUENT RATIOS

Ratio	High	Municipality	Low	Municipality	Arithmetic Average of all plants in Sample Group
Zn:Cu	38	Midland	.05	Port Weller	2.7
Pb:Cu	81	Port Weller	.05	Fergus	1.2
Ni:Cu	11	Midland	.10	Owen Sound	1.2
Cu:Zn	21	Port Weller	.03	Midland	.61
Pb:Zn	1700	Port Weller	.02	Fergus	.34
Ni:Zn	80	Port Weller	.01	Fergus	.49
Cu:Pb	19	Fergus	.01	Port Weller	2.7
Zn:Pb	50	Fergus	.06	Port Weller	5.1
Ni:Pb	5.0	Shelburne	.05	Port Weller	1.3
Cu:Ni	28	Fergus	.09	Midland	2.6
Pb:Ni	21	Port Weller	.20	Shelburne	1.1
	-	-	.20	Markdale	-
Zn:Ni	75	Fergus	.01	Port Weller	5.0

TABLE 96. METAL RATIOS IN TREATMENT PLANT EFFLUENTS

MUNICIPALITY	Zn:Cu	Pb:Cu	Ni:Cu	Cu:Zn	Pb:Zn	Ni:Zn	Cu:Pb	Zn:Pb	Ni:Pb	Cu:Ni	Pb:Ni	Zn:Ni
1. LAGOONS												
Elmvale	3.0	1.0	1.0	.50	.50	.50	1.0	2.0	1.0	1.0	1.0	2.0
Markdale	3.0	1.0	3.0	.33	.33	1.0	1.0	3.0	3.0	.33	.33	1.0
Stayner	3.0	1.0	2.0	.33	.33	.67	1.0	3.0	2.0	.50	.50	1.5
Shelburne	4.0	1.0	2.0	.25	.25	.50	1.0	4.0	2.0	.50	.50	2.0
2. PRIMARY TREATMENT												
Prescott	-	-	-	-	-	-	-	-	-	-	-	-
Collingwood	9.5	1.0	.50	.11	.11	.05	1.0	9.5	.50	2.0	2.0	19
Midland	.33	.33	7.3	3.0	1.0	22	3.0	1.0	22	.14	.05	.05
Owen Sound	5.2	.40	.20	.19	.08	.04	2.5	13	.50	5.0	2.0	26
Cornwall	.75	.10	.25	1.3	.13	.33	10.0	7.5	2.5	4.0	.40	3.0
3. ACTIVATED SLUDGE												
Burlington	1.5	.50	.50	.67	.33	.33	2.0	3.0	1.0	2.0	1.0	3.0
Elmira	-	-	-	-	-	-	-	-	-	-	-	-
Fergus	10.4	.04	.04	.10	<.01	<.01	25	260	1.0	25	1.0	2.6
Orangeville	-	-	-	-	-	-	-	-	-	-	-	-
Stratford	-	-	-	-	-	-	-	-	-	-	-	-
Barrie	.81	.13	1.4	1.2	.15	1.8	8.0	6.5	12	.70	.09	.57
Guelph	2.7	.30	.40	.37	.11	.15	3.3	9.0	1.3	2.5	.75	6.8
Brantford	-	-	-	-	-	-	-	-	-	-	-	-
Port Weller	6.0	1.0	3.0	.17	.17	.50	1.0	6.0	3.0	.33	.33	2.0
Lakeview	4.0	.67	1.7	.25	.17	.42	1.5	6.0	2.5	.60	.40	2.4
Hamilton	8.5	1.0	3.5	.12	.12	.42	1.0	8.5	3.5	.29	.29	2.4
AVERAGE:	4.2	.63	1.8	.60	.25	1.9	4.2	23	3.9	3.0	.70	4.9

TABLE 97. RANGE OF EFFLUENT RATIOS

Ratio	High	Municipality	Low	Municipality	Arithmetic Average of All Plants in Sample Group
Zn:Cu	10.4	Fergus	.33	Midland	4.0
Pb:Cu	1.0	Collingwood	.04	Fergus	.35
	1.0	Port Weller			
	1.0	Hamilton			
	1.0	Shelburne			
	1.0	Elmvale			
	1.0	Markdale			
	1.0	Stayner			
Ni:Cu	7.3	Midland	.04	Fergus	1.5
Cu:Zn	3.0	Midland	.10	Fergus	.45
Pb:Zn	1.0	Midland	<.01	Fergus	.21
Ni:Zn	22	Midland	<.01	Fergus	.46
Cu:Pb	25	Fergus	1.0	Collingwood	6.9
			1.0	Port Weller	
			1.0	Hamilton	
			1.0	Shelburne	
			1.0	Elmvale	
			1.0	Markdale	
			1.0	Stayner	
Zn:Pb	260	Fergus	1.0	Midland	6.2
Ni:Pb	22	Midland	.50	Collingwood	2.9
			.50	Owen Sound	
Cu:Ni	25	Fergus	.14	Midland	1.5
Pb:Ni	2.0	Collingwood	.05	Midland	.55
	2.0	Owen Sound			
Zn:Ni	26	Owen Sound	.05	Midland	3.7

6.13 Individual Metal Concentrations in Sample Group Treatment Plants

Individual metal concentrations in the sample group treatment plants are listed in increasing order of concentration. Metals are indexed as follows:

(1)	Zinc	(13)	Lithium
(2)	Copper	(14)	Cobalt
(3)	Nickel	(15)	Mercury
(4)	Lead	(16)	Tin
(5)	Cadmium	(17)	Vanadium
(6)	Chromium	(18)	Arsenic
(7)	Aluminum	(19)	Barium
(8)	Manganese	(20)	Strontium
(9)	Iron	(21)	Molybdenum
(10)	Calcium	(22)	Silver
(11)	Magnesium	(23)	Selenium
(12)	Titanium		

All concentrations are given in mg/l except for mercury, where the concentrations are in ppb.

1. ZINC

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Elmvale	.03	Lakeview	.60	Midland	<.01
Burlington	.04	Barrie	1.2	Elmvale	.02
Markdale	.05	Burlington	1.2	Stayner	.03
Collingwood	.06	Guelph	14	Markdale	.03
Shelburne	.06	Fergus	80	Burlington	.03
Stayner	.08	Hamilton	520	Shelburne	.04
Owen Sound	.15	Owen Sound	650	Port Weller	.06
Lakeview	.41			Lakeview	.12
Barrie	.43			Barrie	.13
Cornwall	.50			Cornwall	.15
Midland	.75			Hamilton	.17
Port Weller	.78			Owen Sound	.26
Guelph	.88			Guelph	.27
Fergus	4.5			Collingwood	.38
Hamilton	8.1			Fergus	2.6

2. COPPER

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Elmvale	<.01	Owen Sound	.20	Shelburne	<.01
Markdale	<.01	Lakeview	1.6	Elmvale	<.01
Stayner	.02	Burlington	2.2	Stayner	<.01
Midland	.02	Guelph	7.3	Markdale	<.01
Shelburne	.03	Barrie	17	Port Weller	.01
Collingwood	.05	Fergus	36	Burlington	.02
Burlington	.08	Hamilton	71	Hamilton	.02
Owen Sound	.10			Lakeview	.03
Port Weller	.21			Midland	.03
Barrie	.24			Collingwood	.04
Lakeview	.25			Owen Sound	.05
Cornwall	.40			Guelph	.10
Guelph	.61			Barrie	.16
Hamilton	.78			Cornwall	.20
Fergus	1.7			Fergus	.25

3. NICKEL

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Owen Sound	<.01	Burlington	<.20	Owen Sound	<.01
Burlington	.01	Guelph	.22	Fergus	<.01
Collingwood	.02	Lakeview	.36	Burlington	<.01
Elmvale	.02	Fergus	.84	Elmvale	<.01
Stayner	.03	Owen Sound	4.6	Collingwood	.02
Markdale	.04	Barrie	11	Shelburne	.02
Shelburne	.05	Hamilton	27	Stayner	.02
Fergus	.06			Markdale	.03
Port Weller	.07			Port Weller	.03
Barrie	.08			Guelph	.04
Guelph	.14			Cornwall	.05
Midland	.21			Lakeview	.05
Lakeview	.23			Hamilton	.07
Cornwall	.30			Midland	.22
Hamilton	.44			Barrie	.23

4. LEAD

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Burlington	<.01	Burlington	.60	Midland	<.01
Shelburne	<.01	Fergus	1.1	Fergus	<.01
Elmvale	<.01	Lakeview	1.4	Port Weller	<.01
Stayner	<.01	Guelph	3.7	Burlington	<.01
Markdale	<.01	Barrie	9.1	Cornwall	<.01
Owen Sound	.02	Hamilton	96	Shelburne	<.01
Collingwood	.04	Midland	330	Elmvale	<.01
Port Weller	.06			Stayner	<.01
Guelph	.08			Markdale	<.01
Barrie	.08			Owen Sound	.02
Fergus	.09			Barrie	.02
Lakeview	.12			Lakeview	.02
Midland	.14			Hamilton	.02
Cornwall	.80			Guelph	.02
Hamilton	1.2			Collingwood	.04

5. CADMIUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Midland	<.01	Burlington	<.01	Midland	<.01
Owen Sound	<.01	Barrie	.02	Owen Sound	<.01
Collingwood	<.01	Fergus	.05	Collingwood	<.01
Barrie	<.01	Lakeview	.10	Barrie	<.01
Fergus	<.01	Guelph	.45	Fergus	<.01
Burlington	<.01	Hamilton	1.5	Port Weller	<.01
Shelburne	<.01	Owen Sound	2.2	Guelph	<.01
Elmvale	<.01			Lakeview	<.01
Markdale	<.01			Burlington	<.01
Shelburne	<.01			Hamilton	<.01
Guelph	.01			Cornwall	<.01
Lakeview	.02			Shelburne	<.01
Hamilton	.02			Elmvale	<.01
Cornwall	.02			Markdale	<.01
Port Weller	.15			Shelburne	<.01

6. CHROMIUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Elmvale	.01	Lakeview	<.02	Markdale	<.01
Markdale	<.02	Burlington	<.04	Owen Sound	<.01
Shelburne	<.02	Owen Sound	.07	Elmvale	.01
Burlington	.02	Guelph	5.2	Lakeview	<.02
Stayner	.02	Fergus	18	Shelburne	<.02
Collingwood	.04	Hamilton	200	Stayner	.02
Lakeview	.22	Barrie	300	Collingwood	.03
Owen Sound	.35			Burlington	<.04
Port Weller	.64			Port Weller	.04
Cornwall	1.0			Hamilton	.10
Midland	1.2			Fergus	.12
Hamilton	1.2			Barrie	.17
Barrie	7.9			Cornwall	.20
				Guelph	.24
				Midland	.33

7. ALUMINUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Elmvale	.06	Lakeview	16	Collingwood	<.02
Stayner	.08	Fergus	20	Stayner	.02
Shelburne	.09	Burlington	27	Burlington	<.03
Markdale	.10	Owen Sound	160	Elmvale	.03
Collingwood	.16	Guelph	710	Shelburne	.05
Burlington	.19	Barrie	850	Fergus	<.06
Barrie	1.3	Hamilton	11000	Lakeview	<.07
Fergus	1.9			Markdale	.08
Owen Sound	2.6			Midland	.19
Lakeview	5.1			Owen Sound	.42
Port Weller	5.9			Port Weller	.50
Midland	12			Hamilton	.52
Hamilton	20			Barrie	1.4
				Cornwall	1.5
				Guelph	2.2

8. MANGANESE

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Elmvale	<.01	Lakeview	.24	Shelburne	<.01
Shelburne	<.02	Guelph	.52	Elmvale	<.01
Stayner	<.03	Burlington	.70	Stayner	<.01
Markdale	.03	Fergus	1.5	Markdale	<.01
Burlington	.04	Owen Sound	4.6	Midland	.01
Guelph	.05	Barrie	9.9	Lakeview	.02
Owen Sound	.06	Hamilton	40	Burlington	.03
Collingwood	.06			Fergus	.04
Midland	.08			Barrie	.05
Fergus	.15			Guelph	.05
Port Weller	.15			Cornwall	.05
Barrie	.21			Port Weller	.08
Lakeview	.30			Hamilton	.10
Hamilton	1.0			Owen Sound	.10
				Collingwood	.13

9. IRON

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Stayner	.15	Burlington	10.0	Stayner	<.04
Markdale	.15	Lakeview	55	Markdale	<.05
Elmvale	.20	Guelph	67	Burlington	<.05
Burlington	.20	Barrie	250	Elmvale	<.06
Shelburne	<.21	Fergus	620	Shelburne	.08
Collingwood	.65	Hamilton	2200	Barrie	.11
Owen Sound	1.1	Owen Sound	25000	Port Weller	.20
Barrie	1.6			Midland	.20
Cornwall	2.0			Cornwall	.20
Guelph	2.2			Hamilton	.24
Fergus	4.3			Lakeview	.54
Port Weller	5.6			Guelph	.72
Midland	6.4			Owen Sound	2.8
Lakeview	10.0			Fergus	3.1
Hamilton	64			Collingwood	4.0

10. CALCIUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Cornwall	35	Lakeview	68	Stayner	48
Barrie	41	Guelph	180	Elmvale	60
Stayner	54	Burlington	190	Midland	60
Owen Sound	58	Fergus	260	Markdale	64
Midland	64	Barrie	1100	Hamilton	68
Lakeview	64	Hamilton	2700	Barrie	71
Elmvale	64	Owen Sound	33000	Owen Sound	72
Markdale	67			Shelburne	82
Brantford	82			Brantford	83
Shelburne	84			Burlington	88
Burlington	91			Orangeville	89
Guelph	93			Lakeview	94
Orangeville	96			Port Weller	95
Port Weller	100			Fergus	110
Elmira	110			Guelph	110
Hamilton	120			Cornwall	110
Prescott	120			Prescott	110
Fergus	130			Stratford	120
Stratford	140			Elmira	120
Collingwood	260			Collingwood	240

11. MAGNESIUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Collingwood	12	Lakeview	12	Midland	1.6
Elmvale	13	Guelph	25	Collingwood	14
Stayner	14	Burlington	45	Elmvale	15
Lakeview	14	Fergus	65	Stayner	15
Port Weller	15	Barrie	120	Barrie	15
Barrie	15	Hamilton	650	Hamilton	17
Markdale	17	Owen Sound	3700	Markdale	18
Midland	17			Lakeview	20
Shelburne	20			Owen Sound	21
Brantford	21			Shelburne	21
Burlington	21			Burlington	22
Owen Sound	21			Brantford	22
Orangeville	26			Orangeville	24
Hamilton	29			Prescott	30
Guelph	31			Fergus	31
Elmira	32			Port Weller	31
Stratford	34			Elmira	33
Prescott	35			Guelph	35
Fergus	37			Stratford	36

12. TITANIUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Markdale	<.01	Burlington	<.10	Stayner	<.01
Elmvale	.02	Fergus	<.10	Markdale	<.01
Stayner	.03	Guelph	.30	Elmvale	.01
Shelburne	.04	Hamilton	16	Cornwall	.06
Lakeview	<.05	Barrie	42	Midland	<.10
Burlington	<.05	Owen Sound	510	Owen Sound	<.10
Cornwall	.05			Collingwood	<.10
Barrie	.06			Fergus	<.10
Midland	<.10			Guelph	<.10
Collingwood	<.10			Lakeview	<.10
Port Weller	<.10			Burlington	<.10
Owen Sound	.20			Hamilton	<.10
Hamilton	1.2			Cornwall	<.10
				Port Weller	.10
				Barrie	.20

13. LITHIUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Owen Sound	<.01	Fergus	<.01	Midland	<.01
Collingwood	<.01	Guelph	<.01	Owen Sound	<.01
Cornwall	<.01	Lakeview	<.01	Collingwood	<.01
Barrie	<.01	Barrie	<.10	Barrie	<.01
Markdale	<.01	Burlington	<.10	Fergus	<.01
Fergus	.01	Hamilton	.75	Port Weller	<.01
Port Weller	.01	Owen Sound	1.9	Guelph	<.01
Guelph	.01			Lakeview	<.01
Lakeview	.01			Cornwall	<.01
Shelburne	.01			Shelburne	<.01
Elmvale	<.02			Elmvale	<.01
Midland	.02			Stayner	<.01
Stayner	.02			Markdale	<.01
Burlington	.02			Burlington	<.01
Hamilton	.04			Hamilton	<.01

14. COBALT

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Midland	<.01	Barrie	<.01	Midland	<.01
Owen Sound	<.01	Fergus	.02	Owen Sound	<.01
Collingwood	<.01	Guelph	.02	Collingwood	<.01
Barrie	<.01	Lakeview	.02	Barrie	<.01
Fergus	<.01	Burlington	<.20	Fergus	<.01
Port Weller	<.01	Owen Sound	.67	Port Weller	<.01
Guelph	<.01	Hamilton	.75	Guelph	<.01
Lakeview	<.01			Lakeview	<.01
Burlington	<.01			Burlington	<.01
Cornwall	<.01			Cornwall	<.01
Shelburne	<.01			Shelburne	<.01
Elmvale	<.01			Elmvale	<.01
Stayner	<.01			Stayner	<.01
Markdale	<.01			Markdale	<.01
Hamilton	.02			Hamilton	<.02

15. MERCURY

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Owen Sound	.08	Burlington	4.3	Stayner	<.02
Elmvale	.08	Guelph	6.7	Markdale	<.03
Stayner	.08	Fergus	14	Burlington	<.03
Collingwood	.09	Barrie	29	Port Weller	<.05
Shelburne	.15	Hamilton	38	Owen Sound	<.05
Guelph	.16	Lakeview	74	Elmvale	.05
Markdale	.18			Fergus	.05
Fergus	.26			Barrie	.05
Barrie	.28			Collingwood	.06
Burlington	.36			Midland	.08
Port Weller	.50			Shelburne	.10
Midland	.52			Guelph	.11
Hamilton	2.0			Lakeview	.15
Lakeview	9.8			Hamilton	.15

16. TIN

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Owen Sound	<.20	Lakeview	.20	Midland	.10
Fergus	<.20	Fergus	.60	Elmvale	.10
Port Weller	<.20	Guelph	.80	Shelburne	.15
Guelph	<.20	Burlington	<1.5	Markdale	.15
Elmvale	<.20	Barrie	4.0	Stayner	.18
Midland	.30	Owen Sound	33	Owen Sound	<.20
Collingwood	.30	Hamilton	180	Port Weller	<.20
Cornwall	.40			Fergus	.20
Markdale	.40			Guelph	.20
Stayner	.42			Burlington	.30
Lakeview	.42			Hamilton	.40
Barrie	.50			Lakeview	.50
Shelburne	.60			Cornwall	1.0
Burlington	.89			Barrie	1.1
Hamilton	3.5			Collingwood	1.6

17. VANADIUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Midland	<.01	Lakeview	<.01	Midland	<.01
Owen Sound	<.01	Fergus	.03	Owen Sound	<.01
Cornwall	<.01	Guelph	.04	Cornwall	<.01
Stayner	<.01	Barrie	<.20	Stayner	<.01
Markdale	<.01	Burlington	.35	Markdale	<.01
Port Weller	<.01	Hamilton	1.4	Port Weller	<.01
Collingwood	.01	Owen Sound	8.9	Fergus	<.01
Lakeview	.01			Guelph	<.01
Barrie	<.02			Lakeview	<.01
Shelburne	<.02			Burlington	<.01
Fergus	.02			Barrie	<.02
Guelph	.02			Hamilton	<.02
Elmvale	.02			Shelburne	<.02
Burlington	.02			Elmvale	<.02
Hamilton	.04				

18. ARSENIC

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Owen Sound	<.001	Burlington	.008	Midland	<.001
Barrie	<.001	Barrie	.08	Collingwood	<.001
Port Weller	<.001	Lakeview	.17	Barrie	<.001
Cornwall	<.001	Fergus	.64	Fergus	<.001
Stayner	<.001	Guelph	.70	Guelph	<.001
Markdale	<.001	Hamilton	1.2	Lakeview	<.001
Collingwood	.002	Owen Sound	2.4	Burlington	<.001
Elmvale	.002			Cornwall	<.001
Guelph	.003			Brantford	<.001
Lakeview	.003			Stratford	<.001
Burlington	.003			Shelburne	<.001
Fergus	.003			Elmvale	<.001
Brantford	.003			Stayner	<.001
Orangeville	.003			Markdale	<.001
Shelburne	.003			Owen Sound	.001
Prescott	.004			Prescott	.001
Elmira	.005			Orangeville	.001
Stratford	.006			Elmira	.002
Midland	.02			Hamilton	.002
Hamilton	.03			Port Weller	.005

19. BARIUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Stayner	.03	Lakeview	.98	Port Weller	<.01
Shelburne	.04	Burlington	1.0	Stayner	<.01
Owen Sound	.04	Guelph	2.2	Cornwall	<.02
Collingwood	.04	Fergus	4.5	Lakeview	<.02
Burlington	.05	Barrie	23	Guelph	.02
Elmvale	.06	Owen Sound	40	Barrie	.02
Markdale	.06	Hamilton	57	Shelburne	.02
Lakeview	.12			Midland	.03
Port Weller	.12			Collingwood	.03
Guelph	.15			Fergus	.03
Midland	.23			Hamilton	.03
Fergus	.26			Markdale	.03
Cornwall	.30			Elmvale	.04
Barrie	.54				
Hamilton	.65				

20. STRONTIUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Stayner	.16	Lakeview	.49	Stayner	.14
Markdale	.17	Burlington	1.2	Midland	.17
Owen Sound	.22	Fergus	3.2	Markdale	.19
Lakeview	.22	Guelph	3.5	Owen Sound	.21
Midland	.23	Barrie	5.1	Cornwall	.21
Barrie	.26	Hamilton	20	Barrie	.23
Collingwood	.30	Owen Sound	32	Lakeview	.25
Cornwall	.30			Elmvale	.28
Elmvale	.30			Collingwood	.31
Port Weller	.31			Shelburne	.38
Shelburne	.41			Hamilton	.40
Burlington	.45			Port Weller	.53
Hamilton	.68			Burlington	.96
Guelph	1.8			Port Weller	1.0
Fergus	2.0			Guelph	1.1

21. MOLYBDENUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Port Weller	<.01	Barrie	.30	Midland	<.01
Collingwood	<.01	Owen Sound	2.1	Fergus	<.01
Owen Sound	<.01			Port Weller	<.01
Shelburne	<.01			Shelburne	<.01
Elmvale	<.01			Stayner	<.01
Stayner	<.01			Elmvale	<.01
Markdale	<.01			Markdale	<.01
Guelph	.02			Owen Sound	.02
Barrie	.02			Collingwood	.02
Midland	.02			Cornwall	.03
Cornwall	.02			Barrie	.03

22. SILVER

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Midland	<.01	Barrie	.50	Midland	<.01
Owen Sound	<.01	Owen Sound	9.6	Owen Sound	<.01
Collingwood	<.01			Collingwood	<.01
Barrie	<.01			Port Weller	<.01
Fergus	<.01			Cornwall	<.01
Guelph	<.01			Shelburne	<.01
Cornwall	<.01			Markdale	<.01
Shelburne	<.01			Stayner	<.01
Markdale	<.01			Elmvale	<.01
Stayner	<.01			Barrie	<.10
Elmvale	<.01				
Port Weller	.02				

23. SELENIUM

INFLUENT		SLUDGE		EFFLUENT	
Municipality	Conc.	Municipality	Conc.	Municipality	Conc.
Midland	<.001	Owen Sound	<.001	Midland	<.001
Owen Sound	<.001	Barrie	<.001	Owen Sound	<.001
Collingwood	<.001			Collingwood	<.001
Barrie	<.001			Cornwall	<.001
Fergus	<.001			Prescott	<.001
Guelph	<.001			Brantford	<.001
Cornwall	<.001			Barrie	<.001
Elmvale	<.001			Elmvale	<.001
Markdale	<.001			Markdale	<.001
Shelburne	<.001			Shelburne	<.001
Stayner	<.001			Stayner	<.001
Port Weller	.002			Port Weller	.003
Prescott	<.003			Elmira	.006
Stratford	.004			Orangeville	.006
Brantford	.014			Stratford	<.01
Elmira	.014				
Orangeville	.01				

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